

Lang, Cassandra M - DNR

From: IEMS@aol.com
Sent: Thursday, October 31, 2013 8:41 PM
To: DNR Waukesha Diversion App
Subject: Opposed to Waukesha Diversion

Categories: Red Category

To Whom It May Concern:

I note that the City of Waukesha Water Utility has completed their submission of an application for the diversion of water from the Laurentian Great Lakes basin to supply the potable water needs of the City. In reviewing their application, I would like to note that there are several areas where the application would appear to be flawed.

In the first instance, the proposal is based upon continuing growth of demand and an increasing service area. If the City cannot provide water of suitable quality from its current sources, this reason for demanding Great Lakes water seems spurious. There can be no legitimate growth or expansion of service if the City cannot provide water from existing sources. By supplying water from an external source, the uncontrolled urban expansion is abetted and artificially inflates the water demand forecast. The maps provided in the environmental assessment compiled by the City extend well beyond the City limits, even though the City cannot supply water in these areas.

Secondly, impacts to the Fox River are not considered aside from those associated with groundwater demand and substitution of groundwater abstraction to the surfacial aquifer. The fact that the Fox River has been supplemented for a considerable period by treated wastewater discharges is not evaluated or even mentioned. Not only have the flora and fauna of the River become accustomed to the higher flows resulting from wastewater discharges, but downstream communities, especially those in Illinois, depend on the Fox River flows for water supply as well as for the conduct of commerce. I would note that the Fox River Chain of Lakes in Illinois is wholly dependent upon the flows from the upstream watershed of the Fox River. Estimates of the economic impact of reduced water flows on these downstream areas are not considered or even mentioned. Similarly, while there was some discussion of impacts of groundwater abstraction on the Vernon Marsh, there was no mention of the impact of reduced surface water flows on this wetland complex, no mention of the recreational impacts on this system, and no analysis of the economic impacts of a diversion of water from the Fox River, even simply within Wisconsin let alone considering Illinois. Surely, the interstate impact must be considered. Data provided in the Southeastern Wisconsin Regional Planning Commission reports and reproduced in the Southeastern Wisconsin Fox River Commission implementation plan suggest that the flow comprised of treated wastewater discharged by the City of Waukesha plant could potentially make the difference between flow in the Fox River and no flow, during periods of low precipitation. While the City of Waukesha is considering its own growth (to build out), there is a complete absence of discussion of the impacts on the "legitimate growth" of the downstream municipalities.

Thirdly, the City's much promoted conservation plan omits some key points. Specifically, the fact that there are relatively few households in the City that can meet the requirements of the toilet replacement rebate program: the City has vast areas of apartment-based multi-family housing that are excluded from the program since they are not owner-occupied. Also, the requirement that a plumber replace the toilets could be a further limiting factor given the current economic climate, even for those few households that would qualify for the program. Surely, it would be better to replace these facilities rather than import water to the City through the proposed diversion. In other cities in which I have resided, the municipality provided low flow shower heads, faucet aspirators, and toilet mechanisms to households as a first step in reducing water use. Additionally, true conservation would suggest that tariffs be put into place to charge large water users higher fees, rather than reducing charges for large water users.

Fourthly, the radium issue could of and should have been addressed by the Utility decades ago when the US Environmental Protection Agency first promulgated the higher standards. The City had access to technological solutions to this concern, but chose to employ attorneys to challenge the standard rather than comply, at least according to a news article which I recall from the mid-1990s. This cavalier attitude of the Utility toward meeting their obligations to the public has been demonstrated by the disbursement of the funds raised through the recent fee increase granted by the Public Service Commission--staff were given raises, new vehicles were purchased and consultants were given retainers (per the Utility commission's own minutes of their April/May 2013 meetings). The funds were not directed toward the stated purpose of providing better quality drinking water.

Likewise, the dismissal of the use of surface water as a drinking water supply is equally disingenuous, as can be demonstrated by the use of the self-same surface water by downstream municipalities (especially in Illinois). Dismissing the use of surface water supplies on the basis that treatment would be required is demonstrating an ignorance of water treatment technologies in widespread and common use throughout much of the world. This would not necessarily involve direct reuse of treated wastewater or even indirect reuse, although the location of the City of Waukesha relative to the upstream municipalities would include indirect reuse. I have lived in municipalities where this issue was significant, given a large Muslim population for whom reuse of wastewater was anathema; however, even in those situations indirect reuse following discharge of highly treated wastewater into surface reservoirs met the religious objections voiced by the citizens. Cavalier dismissal of these alternatives as socially unacceptable flies in the face of experience worldwide.

Fifthly, I would note that the economic impacts of the proposal are not fairly evaluated. In a world where there are increasing energy costs, the costs associated with the pumping of water to and from the Great Lakes will only increase with time. Assuming that the cost of pumping water an equivalent vertical distance over the divide as being equal to the costs of pumping groundwater from the City's deepest well ignores the fact that there is considerable horizontal distance involved in the pumping across the Great Lakes watershed. This will not only incur significant construction costs in terms of pipelines and easements along the pipeline route, but also increasing operational costs associated with the pumping of water along the land surface. The proposal also does not clearly identify the fact that in order to return "at least 100%" of the Great Lakes water abstracted, some volume of water will have to be made up to account for transmission losses enroute. The benefit to groundwater resources mentioned in their assessment cannot be as great as suggested if these water sources will have to be tapped to provide make up water necessary to ensure that 100% of the volume abstracted from the Great Lakes is returned. Even assuming that infiltration and exfiltration from the pipeline is balanced (unlikely), additional water will have to be obtained to make up for the volume of virtual water exported from the City--virtual water being water contained in products that are not consumed in the City but shipped out of the City to other destinations. Such a need would continue to impose impacts on the aquifers and on the Fox River and its tributaries that are not recognized in the proposal.

In short, this proposal seems to be ill considered and incomplete from the perspective of acknowledging the impacts and costs associated with the proposed diversion, even though it would appear to meet the letter of the requirements of the State of Wisconsin (as embodied in the statement that the WDNR has deemed the application to be complete). It appears that the City has determined that Great Lakes water is THE answer to the City's water supply needs, and has determined that the "facts" will be evaluated so as to support this alternative and this alternative alone. Use of surface water, groundwater augmentation, and streambank inducement, among other viable options, seem to have been discounted based on conjecture, without good sound evidence to the contrary, and the impacts to the Fox River completely dismissed. Service areas have been created without regard for the ability of those areas to be serviced, and conservation has been touted where little real effort has been made or considered. Let the City live within its means--if the Utility cannot provide water, this is a limit to growth and further development must be acknowledged as unsustainable.

Respectfully submitted,

Jeffrey A. Thornton PhD PH CLM
Managing Director
International Environmental Management Services Ltd
P O Box 735
Waukesha WI 53187-0735
email: iems@aol.com
tel: +1 920 627 9925

Lang, Kassandra M - DNR

From: Sean Hayes <seanjhayes@gmail.com>
Sent: Monday, November 04, 2013 8:56 AM
To: DNR Waukesha Diversion App
Subject: Waukesha's Request for Lake Michigan Water

I am against allowing Waukesha to take water from the Great Lakes Basin. I think it is a slippery slope.

Sean

Lang, Kassandra M - DNR

From: Joshua Naker <lakestate.joshua@gmail.com>
Sent: Thursday, November 07, 2013 9:43 AM
To: DNR Waukesha Diversion App
Subject: Root River Waste Water

Categories: Red Category

Good morning,

First of all, I do not agree with the idea of pumping Lake Michigan water outside of the Great Lakes basin. The law states that 100% of the water taken from the basin shall be returned to the basin. 100% of the water will not return. It seems impossible to complete this order. However, if the Great Lakes Basin Compact allows Waukesha to obtain fresh water from the Great Lake Basin, I believe that flowing the treated waste water back down the Root River into the Great Lakes basin is a excellent project. It would create overall improvement for the Root River and the activities that would follow would be numerous. Thank you very much and take care.

Joshua Naker
5626 Middle Road
Racine, WI 53402

Lang, Kassandra M - DNR

From: Alex Brower <alexbrower@gmail.com>
Sent: Sunday, November 10, 2013 2:36 PM
To: DNR Waukesha Diversion App
Subject: I am against the water diversion

To whom it may concern:

I agree with many environmental groups that Waukesha can drill its own wells instead of using lake Michigan water. Deny their diversion petition!

Alex Brower
2430 North Booth Street, Upper
Milwaukee, WI 53212

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Alex Brower
920-723-3392
alexbrower@gmail.com

Lang, Kassandra M - DNR

From: Greg Hines, Executive Director <execdirector@glacierlandrccd.org>
Sent: Monday, November 11, 2013 10:21 AM
To: DNR Waukesha Diversion App
Subject: Waukesha Water Issues

Waukesha is responsible for the conundrum that it finds itself in with its water issues. Though unfortunate, it must be an example to the Great Lakes area for their reckless mistakes and be accountable for them. I strongly favor they find water elsewhere other than taking the easy way out and jeopardizing our water supply from the Great Lakes watershed. If they are allowed exemption then nothing will stop other communities from doing so. The buck (water) stops in Waukesha!!! Thank you for allowing me to comment.

Grass Based Farming = Cleaner Water

Greg Hines, Executive Director
Glacierland RC&D
3071 Voyager Drive, Suite E
Green Bay, WI 54311
CELL: 404.368.7845
920.465.3006
920.884.1243 (fax)
www.glacierlandrccd.org

Our mission:

"Conserve and develop sustainable resources for healthy and vibrant communities."

Lang, Kassandra M - DNR

From: Margaret Heller <mheller007@wi.rr.com>
Sent: Monday, November 11, 2013 8:07 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake I am seriously concerned. Just this morning I was watching a news program regarding investment and they recommended as a number one investment - water. Everything you do right now sets a precedent for water usage and Waukesha is just one tiny community. What about Arizona? Colorado? Saudi Arabia? We need people to conserve in Waukesha, and Arizona and in the coastal Lake Michigan cities. I live in Kenosha and there has not been one bit of pressure to conserve. people water lawns and sidewalks and it flows into the sewers; people take long showers; and leave tap water running while washing dishes. Selling off the Lake is not the way to save the Lake or to make money - charge more for it and make people conserve. Make Waukesha find ways to retain water not borrow water.

Margaret Heller
217 69th Street
Kenosha, WI 53143

Lang, Kassandra M - DNR

From: Joseph Wiesner <joewiesner@gmail.com>
Sent: Monday, November 11, 2013 10:58 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

The City of Waukesha's application to use Lake Michigan water is a landmark decision. That's obvious; less obvious is how much the city has done to satisfy the requirements of the Great Lakes Compact that make a diversion like this a last resort.

I trust the DNR will hold Waukesha to the very high standards a decision like this demands. We mess with Lake Michigan enough as it is.

Thank you,

Joseph Wiesner
2005 N Commerce St
2005 N Commerce St
Milwaukee, WI 53212

Lang, Kassandra M - DNR

From: Lois Keel <lakeel05@gmail.com>
Sent: Monday, November 11, 2013 11:07 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

To take a look across Lake Michigan, you might think that it holds plenty of water for everyone, but most of us know that that's not true, and that some day, in the not too distant future, we may find that we're over-committed to siphoning water out of the lake.

I don't know enough of the particular details of Waukesha's application to buy water from Lake Michigan to weigh in on your final decision., but I do ask that you look very carefully at their current water usage, their efforts to reduce water use, and whether they have a vision for their future regarding water availability.

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, it is done in many other parts of Wisconsin and elsewhere around the nation. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Lois Keel
707 N Blackhawk Ave
Madison, WI 53705

Lang, Kassandra M - DNR

From: Randy O'Connell <rolokm@sbcglobal.net>
Sent: Tuesday, November 12, 2013 12:00 AM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, it is done in many other parts of Wisconsin and elsewhere around the nation. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

I find it to be funny that while exhibiting irresponsible water use practices, at the same time Waukesha is attempting to crack the Great Lakes Water Compact. They are so brazen that they cannot even come with "hat in hand" to request this service.

Waukesha has a proven record of not cooperating with Milwaukee on regional matters (take transportation as an example), while at the same time enjoying all that Milwaukee offers.

Now they want more that does not belong to them. Why does Waukesha feel they are beyond an international law?

Thank you,

Randy O'Connell
3929 Marquart Ln

Omro, WI 54963

Lang, Kassandra M - DNR

From: Mary McIlvaine <marysew@yahoo.com>
Sent: Tuesday, November 12, 2013 5:20 AM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. The phrase "First, do no harm" also comes to mind. Conservation efforts are often brushed aside in the rush to use our limited natural resources. Conservation should be explored as a first, not a later option. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, it is done in many other parts of Wisconsin and elsewhere around the nation. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Mary McIlvaine
1022 Villa Street
Racine, WI 53403

Lang, Kassandra M - DNR

From: Cécile Stelzer-Johnson <frenchieonspyder@gmail.com>
Sent: Tuesday, November 12, 2013 8:15 AM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. How does that request mesh with the Great Lakes Compact?

Aren't there a number of lakes much closer to Waukesha? What kind of expenses are we talking about? Who would foot the bill? Would the people in the Fox valley also receive the refuse water from Waukesha? Diverting water from the Michigan lake (more than 20 miles away) is bound to be a horrendously expensive proposal. What efforts had the city made to conserve water?

Please think long and hard before you approve such a measure.
Thank you,

Cécile Stelzer-Johnson
11831, 80th St. South
Wisconsin Rapids, WI 54494

Lang, Kassandra M - DNR

From: Anne Miller <milleranne.8227@yahoo.com>
Sent: Tuesday, November 12, 2013 11:00 AM
To: DNR Waukesha Diversion App
Subject: Waukesha application for Lake Michigan water use

Dear DNR:

We understand that Waukesha has submitted a revised application to buy Lake Michigan water, requesting to take 10.1 million gallons from it daily – nearly 3.7 billion gallons a year!

Please make water conservation a top priority as you evaluate Waukesha's application. Please hold Waukesha's application to the highest standards. We feel that Waukesha, our County of residency, should first take common sense steps to reduce its water use and maximize the safe water resources we have available.

This is serious, and we hope that Lake Michigan water is used only as a last resort.

Thank you for your consideration!

Sincerely,

Dr. and Mrs. Paul R. Miller
333 Golden Cedar Lane
Oconomowoc, WI 53045

Lang, Kassandra M - DNR

From: Linda Hansen <dlhnorth2@gmail.com>
Sent: Tuesday, November 12, 2013 11:44 AM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

While this seems to be a form letter to you, I agree with the points contained herein. As the Great Lakes are the largest source of fresh water we have, they are under constant attack. We need to protect these waters in all ways possible as a resource for our future. Perhaps the City of Waukesha could consider cleaning their own water source instead of just taking something they have no right to.

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, it is done in many other parts of Wisconsin and elsewhere around the nation. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Linda Hansen
2984 Tam Lane
Sayner, WI 54560

Lang, Kassandra M - DNR

From: Supervisor Ken Hall, Racine County District 10 <Hall.4.racine@sbcglobal.net>
Sent: Tuesday, November 12, 2013 12:12 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Wisconsin Department of Natural Resources

Dear Mr. Eric Ebersberger:

I am concerned that the City of Waukesha's revised application to divert water from Lake Michigan does not meet several basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for Great Lakes stewardship to protect this resource for future generations.

Conservation not resourced: The City of Waukesha has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. While Waukesha has a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Need unproven: Until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used with a wholehearted conservation effort.

Downstream impacts not understood: Additionally, the Department must fully evaluate the environmental impacts locally and downstream on the Fox and Root River ecosystems. Water quality and quantity in that system cannot be overlooked in this process.

Out of basin water comes back: Finally, the Compact requires that as much of the water returned to the Basin originate from within the Basin as possible, and that the "return" of water from outside of the Basin is minimized. This reduces the potential for contaminants to enter into the Basin. However, information from Waukesha suggests that well over one-third of the water it would send back to Lake Michigan under its preferred diversion and return flow plan will be water from the Mississippi Basin. This volume of out-of-Basin water violates the requirements of the Compact.

Lake Michigan is extremely valuable to our local, state and regional economies, to our family and community quality of life, and to future generations. There is a lot at stake for everyone in this first test of the Great Lakes Compact. Please ensure that Waukesha fully meets the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Ken Hall

Racine County Supervisor, District 10
205 East Four Mile Road
Racine WI, 53402

Lang, Kassandra M - DNR

From: Pfeiffer, Shaili M - DNR
Sent: Tuesday, November 12, 2013 12:29 PM
To: DNR Waukesha Diversion App
Subject: FW: DNR Website Information Request: Watershed Management

From: dmbarth@mtc.net [mailto:dmbarth@mtc.net]
Sent: Tuesday, November 12, 2013 11:46 AM
To: Damgaard, Marjorie S - DNR
Cc: DNR WEB FEEDBACK
Subject: DNR Website Information Request: Watershed Management

The Referring URL: <http://dnr.wi.gov/contact/>

As a member of Clean Wisconsin I would like to express my concern about Waukesha's request to draw a great deal of water from Lake Michigan. I know Wisconsin is one of the signatories to the Great Lakes Compact, and ask that you hold Waukesha's request to the highest standards as outlined in that Compact. The Great Lakes should not become the Colorado River of the upper Midwest. Thank You, Daniel Barth

Contact Information:

Name: Daniel Barth
Phone: 7156934257
Cust#:
Reg#:
Email: dmbarth@mtc.net

Lang, Kassandra M - DNR

From: George Perkins <geoperkins@yahoo.com>
Sent: Tuesday, November 12, 2013 12:32 PM
To: DNR Waukesha Diversion App
Subject: Waukesha's water options must use Lake Michigan as last option

Dear Mr. Ebersberger:

Evaluation of the City of Waukesha's revised application to divert Lake Michigan water must weigh heavily the need for water conservation. I am concerned that the revised application does not meet basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

[1.] Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. The Waukesha Water Utility has failed to put sufficient resources into enacting a conservation plan thus far.

[2.] Only when the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate water, will they have met the requirements of the Compact and Wisconsin law. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

This application for diversion is a precedent-setting moment. It is crucial to get it right!

As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

George Perkins
442 Toepfer Ave
Madison, WI 53711

Lang, Kassandra M - DNR

From: Paul Sagan <p.sagan@sbcglobal.net>
Sent: Wednesday, November 13, 2013 10:16 AM
To: DNR Waukesha Diversion App
Subject: Waukesha water diversion to the Root River

Categories: Red Category

My name is Paul Sagan and I live at 7933 County Line Road in Caledonia. I would like to know what the water from Waukesha is going to do to the level of the Root River. At least once a year my land becomes a lake because the river is too silted up to handle rain and overflows its banks. County Line Road is covered with water and impassable several times each year. Adding more water is not going to improve that condition. The water table is already high and adding more water will make my sump pumps run constantly.

Why can't Waukesha reuse the water instead of sending it down the river? I assume they are partially treating the water before it hits the river so why not treat it completely and send it back through their water pipes? Or if it has to be returned to Oak Creek then why not pipe it into Oak Creek's sewer system so it goes right back to the source and avoids the Root River?

Lang, Kassandra M - DNR

From: Dave Marshall <underh2ohab@mhtc.net>
Sent: Wednesday, November 13, 2013 11:28 AM
To: DNR Waukesha Diversion App
Subject: Opposed to Waukesha Diversion

Categories: Red Category

I am opposed to the proposed City of Waukesha diversion that would compromise the Great Lakes Compact. I've commented in this issue previously in the form of a letter to the editor of the Milwaukee Journal Sentinel and remain firmly opposed to this shortsighted proposal. The City of Waukesha and surrounding areas have dismal records of land use and water resources planning and should not be rewarded by allowing water diversion from the Great Lakes.

Sincerely,

Dave Marshall, Aquatic Ecologist/Licensed Hydrologist
Underwater Habitat Investigations LLC
8951 Clay Hill Road
Barneveld, WI 53507

Lang, Kassandra M - DNR

From: Peggy & Mike McAloon <mcaloon@centurytel.net>
Sent: Wednesday, November 13, 2013 12:39 PM
To: DNR Waukesha Diversion App
Subject: Fwd: City of Waukesha's Diversion Plan

Sorry, I forgot to put my name on the previous email.

I am opposed to the City of Waukesha's plan to divert water from Lake Michigan for municipal use for the following reasons:

The City's application does not meet several of the most basic requirements of the Great Lakes Compact:

- The City of Waukesha has not made a compelling case that it is without a reasonable local water supply alternative and, therefore, it does not need a diversion;
- The City seeks water for a greatly expanded service area that includes communities or portions of communities that have their own adequate supplies of potable water;
- The City does not fully employ conservation measures available to reduce its water need;
- The City proposes to discharge treated wastewater into a waterway that is already impaired by pollution and does not demonstrate how this would comply with the requirements of the Clean Water Act.

Peggy M McAloon

N8740 612th Street

Colfax, WI 54730

Lang, Kassandra M - DNR

From: sandy@sandyhamm.com
Sent: Wednesday, November 13, 2013 2:24 PM
To: DNR Waukesha Diversion App
Subject: Waukesha Water Diversion Application

Categories: Red Category

Hi there,

I live in Waukesha, and I can't imagine that this is a worthy application.

I encourage you to deny it, as it is deficient in several ways, beyond the absurdity of the effort.

I believe that...

1. Until the City of Waukesha stops annexing land and increasing its burden of supplying water no one should listen to their concerns.
2. The City of Waukesha has several other options for water, including filtering and blending.
3. The entire notion of pumping water over the "Little Divide" of Sunnyslope hill and then back again is wasteful and an unproductive use of our natural resources.
4. An approval, or even the effort to get one, can lead to additional attempts by others communities that will ultimately be to the detriment to the Lakes.

Respectfully,
Sandy Hamm

Lang, Kassandra M - DNR

From: William McMullin <mcmullinw@gmail.com>
Sent: Wednesday, November 13, 2013 5:25 PM
To: DNR Waukesha Diversion App
Subject: Waukesha Diversion Application

Please do not allow Waukesha to divert water from the Great Lakes.

The City's application does not meet several of the most basic requirements of the Great Lakes Compact:

- The City of Waukesha has not made a compelling case that it is without a reasonable local water supply alternative and, therefore, it does not need a diversion;
- The City seeks water for a greatly expanded service area that includes communities or portions of communities that have their own adequate supplies of potable water;
- The City does not fully employ conservation measures available to reduce its water need;
- The City proposes to discharge treated wastewater into a waterway that is already impaired by pollution and does not demonstrate how this would comply with the requirements of the Clean Water Act.

Thank you.

William McMullin
510 Montrose Ave., Apt. 5
Royal Oak, MI 48073

Lang, Kassandra M - DNR

From: Lisa Conley <lconley101@gmail.com>
Sent: Thursday, November 14, 2013 12:05 PM
To: DNR Waukesha Diversion App
Subject: Comments on Diversion Application

Categories: Red Category

Comments for the Wisconsin Dept. of Natural Resources regarding the City of Waukesha's Application for Great Lakes Water.

Submitted by Lisa Conley, member of the SEWRPC Regional Water Supply Plan Advisory Committee

1. Water Quality Impacts to Lake Michigan: While much has been said about diluting the pollution of the Root River, there will be impacts to Lake Michigan, including an additional phosphorus load (unless Waukesha can get it's load to zero), and another community's load of unregulated but potentially harmful chemicals, including pharmaceuticals, fire retardants, etc. Already algae blooms are a problem for Lake Michigan beaches, and studies are showing impacts on fish sex and behavior from the unregulated chemicals. I would like to hear an honest discussion of this situation and the expected impacts. I wonder how these chemicals will affect fish reproduction in the Root River.

2. Expanded Water Service Area: I don't believe the SEWRPC Regional Land Use Plan was developed at a time when the extent of the groundwater issues facing Waukesha were fully understood. Rather than relying on the existing recommendation for expanding the water service area, I would like to see the advisability of the proposed expansion revisited with this new information. Approval of this application by all states and provinces is by no means guaranteed, and Waukesha may be forced to live within its means. Green areas of the map designating environmental corridors can still be developed at 5 acre densities, all trees removed, and large areas made impervious under existing law. It makes sense to me that future development in Waukesha County should be contingent on an adequate water supply, and not magnify existing shortages.

3. Better Use of Rainwater could be made: I would like to see the plan include a full out effort to capture and use rainwater to recharge the shallow aquifer. The City of Waukesha could be giving incentives for rain gardens, and install infiltration areas in public spaces, such as the storm water park in Menominee Valley in Milwaukee. The Urban Ecology Center captures rainwater for use flushing toilets. Too much stormwater is treated as a problem and directed to the river when it could be used to better advantage as a resource.

4. Recycling Existing Water supply: I did hear some effort in this direction, but I think much more could be done. Greywater should be routinely captured and used as a valuable resource by commercial, public and residential water users.

5. Landscape Watering with treated drinking water: A great deal of the needed water supply is directed to lawn watering, despite the restrictions imposed by the City of Waukesha. This seems outrageously wasteful to me. Someone can still water their lawn all night two days a week. Besides that, many homes have two water meters with separate charges, one for water supply, and the other for wastewater leaving the home. The result is that people pay less for water used on their yards than they do for drinking water. Part of the plan should be to eliminate this situation, and ban the use of treated drinking water for landscape use.

6. More numbers needed: I would like to see an evaluation of how much the amount of water requested would be reduced by:

Enhanced recharge of the aquifer with increased stormwater capture and infiltration

Banning the use of treated drinking water for landscape use

Putting a moratorium on future growth until an adequate water supply can be assured.

--

Lisa Conley

262/567-5947

lconley101@gmail.com

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

Margaret Mead

Lang, Cassandra M - DNR

From: Jeanne DeSimone Sieger <jdzonaverde@hotmail.com>
Sent: Thursday, November 14, 2013 2:02 PM
To: DNR Waukesha Diversion App
Subject: Protect Lake Michigan

The City of Waukesha's application does not meet several of the most basic requirements of the Great Lakes Compact:

- The City of Waukesha has not made a compelling case that it is without a reasonable local water supply alternative and, therefore, it does not need a diversion;
- The City seeks water for a greatly expanded service area that includes communities or portions of communities that have their own adequate supplies of potable water;
- The City does not **fully** employ conservation measures available to reduce its water need;
- The City proposes to discharge treated wastewater into a waterway that is already impaired by pollution and does not demonstrate how this would comply with the requirements of the Clean Water Act.

These are critical issues that need to be addressed in order to protect Lake Michigan and ensure that the Compact's provisions over the use and protection of our Great Lakes are followed.

Please address these and other deficiencies in the City of Waukesha's application in a straightforward manner. It must be ensured that these issues are fully resolved and in compliance with the Great Lakes Compact, or if not, this application should not be approved.

Let us protect the integrity of the Great Lakes Compact, which prohibits diversions except under limited circumstances and only as a **last** resort.

Sincerely,

Jeanne De Simone Sieger
9651 South 31 Street
Franklin, Wisconsin
53132-9528

Lang, Kassandra M - DNR

From: Paul Sagan <p.sagan@sbcglobal.net>
Sent: Thursday, November 14, 2013 2:55 PM
To: DNR Waukesha Diversion App
Subject: waukesha water

Categories: Red Category

I was at the meeting in Oak Creek last night and was told that the DNR feels that putting the return water from Waukesha into the Root River is "ecologically" better than running it by pipe back to Lake Michigan. If ecologically means more flooding above the dam, then I agree. When the flood waters are edging closer to my house every year, then we will see what minimal difference those 9 million gallons a day will make.

Since Oak Creek is benefiting financially from the water sales, let the return water flow into their sewer system so they can deal with it. The main feeder sewer that runs down Ryan Road so it would be cheaper to hook up to that than running the return pipe to 60th and Oakwood.

I was also told that the increased water flow will be good for the fish hatchery below the dam which doesn't have enough water. In my mind, the Waukesha return water is not the solution, getting rid of the dam will get you a whole lot more water below the dam. If water below the dam is what you are looking for, run the return pipe to the dam so it doesn't cause any more flooding in my back yard above the dam.

The Root River is silted up and filled with dead trees and garbage. If you aren't going to dredge it out as part of this project it will cause more flooding. In addition it will raise the water table which will cause my sump pumps to run even more.

I would be happy to share my pictures with you of recent flooding and then you can explain to me how more water won't make a difference

Paul Sagan
7933 County Line Road
Caledonia

Lang, Kassandra M - DNR

From: Mary Minton <water@BasicISP.net>
Sent: Friday, November 15, 2013 10:02 AM
To: DNR Waukesha Diversion App
Subject: diversion of water from Lake Michigan

I object to the diversion of water from Lake Michigan to Waukesha....I feel they have resources and need to manage their own available water better, than what has been shown to date

Thank you

Mary Minton

To the Wisconsin Department of Natural Resources:

The Great Lakes Compact is a multi-state agreement among eight US states and Canadian provinces which became law in the US under President Bush in 2008 and the same in Canada. This Compact calls for the Great Lakes to protect these waters, implement strong water conservation measures and prohibit diversions from the Great Lakes only in the case of a rare exception when rigorous standards can be met.

In its proposal, Waukesha has not measured up:

- The city has not proven it is without an alternative water supply.
- The city intends to use this water not only for itself but for additional communities which have an adequate water supply.
- The city has not employed conservation measures as called for by the Compact, thereby reducing its need for outside water.
- In the present plan, treated water would be moved through a polluted system—not acceptable.

In summary, Waukesha needs to go back to the drawing board. The city has not complied with the requirements of the Compact and this proposal should not be approved if we want to protect the world's greatest supply of fresh water.

Suzanne Moynihan, SSND

Director, the Edge

A program devoted to ecological education with a spiritual base

Lang, Kassandra M - DNR

From: Marga Krumins <margakkrumins@hotmail.com>
Sent: Sunday, November 17, 2013 2:57 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date. In fact, as a Waukesha resident, the only measures of whose implementation I am aware, is the limitation on outdoor watering and a rebate for low-flow toilets that requires professional installation of the toilets - kind of counterproductive.

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort. Whether or not doing so would be even more detrimental from a regional environmental standpoint, is an entirely separate question, beyond the scope of the application itself.

Additionally, the Department must fully evaluate the environmental impacts locally and downstream on the Fox River and its associated ecosystems. Water quality and quantity in that system cannot be overlooked in this process.

Finally, the Compact requires that as much of the water returned to the Basin originate from within the Basin as possible, and that the "return" of water from outside of the Basin is minimized. There are good reasons for this requirement; for example, it reduces the potential for contaminants to enter into the Basin. However, information from Waukesha suggests that well over one-third of the water it would send back to Lake Michigan under its preferred diversion and return flow plan will be water from the Mississippi Basin. I am concerned this excessive volume of out-of-Basin water violates the requirements of the Compact.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Marga Krumins

321 Harrison Ave
Waukesha, WI 53186

*The presentation gave, in my opinion, an over
simplified view of the impacts on the Root River.
Waukesha Water Utility
CITY OF WAUKESHA, WISCONSIN While there may be
Public Briefing on Great Lakes Water Application minimal adverse
effects the

PUBLIC COMMENT FOR DEPT. OF NATURAL RESOURCES

November 14, 2013

Waukesha's application is currently being reviewed by the Wisconsin Department of Natural Resources. If you want to provide comments to the DNR, you may drop this completed form in the COMMENT BOX or you may mail it to the DNR at Wisconsin DNR, DG/5, PO Box 7921, Madison, WI 53707-7921, Attention: Kassie Lang, no later than December 2, 2013.
Actualized may also be minimal. Monitoring must continue if diversion is granted.
RECEIVED-DNR

Date: 11-14-13

NOV 18 2013

Name: Julie Kinzelman DRINKING WATER & GW

Address: c/o 730 Washington Ave., Racine, WI 53403

Who you represent: City of Racine Health Department

Comment: Studies in support of the application view the preferred route of return as a purely riparian system and models projections are based on the hydrodynamics associated with this. However, the Horlick Dam creates a significant impoundment immediately upstream. This is functionally a lake and behaves differently. Current discussions are occurring on future directions/actions w/ respect to the dam. Any hydrodynamic modelling and future projections must take into account the full range of potential future actions. Nutrients: WWTP effluent discharge limits are typically higher than recommended standards for rivers and streams. The additive impact of additional nutrient influx must take into account the synergistic relationship between →

nutrient load and sediments. ^{not just a supposed dilutional effect} Some reaches of ^(*) the Root River are currently impaired for TSS and nutrients; more are likely to be added as a result of new data generated by the City of Racine Health Department in support of a Root River Restoration Plan. Fecal indicator bacteria loading occurs as a result of storm water runoff from agricultural and urban landscapes. With a relatively low base flow along portions of the mainstem and at the junction of the mainstem and tributaries, the Root River currently may function as a sink rather than a source for the delivery of sediment bound ^(at junctions) micro-organisms from upstream to downstream locations. The association and ^(*) dissociation of bacteria and nutrients from river bed and suspended solids must be considered if the hydrology is to be altered. The return flow is touted as a benefit to aquatic species, such as Steelhead. Once again, do model projections account for little to no alteration to the Horlick Dam spillway? Upstream increases in base flow ^(w/c are likely to be relatively small at times) may have little to no impact on reaches below the dam. ^(incl. the new Steelhead Facility) Continued monitoring of the Root River will be necessary to determine actual vs. predicted/modelled impacts be they positive or negative. Data collected in support of the Root River Restoration plan could serve as a baseline. W1 Waukesha over use has resulted in draw down ~ fully articulate what measures will be taken for future groundwater recharge.

... Dilutional effects will not be uniformly felt

November 18, 2013

Marcus Smith
2300 N Dr. Martin Luther King Jr Dr
Milwaukee WI 53212

This letter is in response to the Friday, November 15th front page article in The Journal Times entitled "Waukesha pitches using Root River for wastewater, says it will be clean." Being the golf course superintendent of Racine Country Club, and with our golf course located within the flood plain of the Root River, I can unequivocally state that this is an atrociously poor idea for the owners of any property located within the Root River flood plain.

Simply stated, the Root River continues to flood more frequently and more severely with each and every year. It is easy for me to remember the month of June in 2008 when the Root River crested over 11 feet and completely demolished two of our asphalt tennis courts, caused many thousands of dollars of damage to our irrigation system, and basically flooded 5 golf holes completely for 1 week. Most other property owners within the flood plain of the Root River experienced similar hardships.

Common sense tells me that sending 11.7 million gallons of used water into the river, thereby adding six inches to the Root Rivers daily water level, will only exaggerate our already serious flooding problems. In February 2010 we spent many thousands of dollars working closely with the DNR in removing many tons of debris from the banks of the Root River that had accumulated from many years of repeated flooding. The banks were then restored to their original state allowing for more efficient water flow and improved wildlife and fish habitat.

Any process or addition to the Root River that would increase its water level by any amount is very detrimental to every property owner within the Root River flood plain.

Sincerely,

Mike Handrich, CGCS
Racine Country Club
2801 Northwestern Ave.
Racine, WI 53404

Lang, Kassandra M - DNR

From: Jim Pindel <jpindel@wi.rr.com>
Sent: Tuesday, November 19, 2013 10:48 AM
To: DNR Waukesha Diversion App
Cc: abarrows@waukeshacounty.gov; Al Sikora; Barbara Holtz; Bob Bartholomew; D. Scott; D'Antuono, James R - DNR; Dean Falkner; Doug Koehler; Francis Stadler; Jim Pindel; mary; Randal Craig; Randy Meier; Sampson, Chad; Shelley Tessmer; Slawski, Thomas M.
Subject: Opposition to City of Waukesha diverting waste water discharge away from the Fox River

To whom it may concern,

The Southeastern Wisconsin Fox River Commission (SEWFRC) is charged by state law with the responsibility of caring for the Fox River, presently from the northern boundary of the City of Waukesha on the north downstream to the point immediately below the Waterford dam on the south. Specifically our charge is to:

- (a) **Protect and rehabilitate the water quality** of the surface waters and the groundwater of the Illinois Fox River basin that are located in a river municipality.
- (b) **Protect and enhance the recreational use of the navigable waters** of the Illinois Fox River basin that are located in a river municipality.
- (c) **Increase water and boating safety on the navigable waters** of the Illinois Fox River basin that are located in a river municipality.

Because of these directives we are very concerned with the possibility of any change in the discharge of water from the City of Waukesha's wastewater treatment plant into the Fox River. Presently this discharge of very clean treated effluent is a significant portion of the flow of the Fox River, especially during the summer and fall seasons when the river's flow is usually reduced by dry weather. This source of flow is essential to the navigability of the river for recreational boating and the preservation of the high quality fishery, including a number of endangered, threatened, and special concerned species.

For these reasons the SEWFRC is going on record with the City of Waukesha stating that we are opposed to any change from the present discharge schedule of treated effluent into the Fox River especially during low-flow periods.

Sincerely,
The Southeastern Wisconsin Fox River Commission

Lang, Kassandra M - DNR

From: Greeney <pwgreeney@icloud.com>
Sent: Tuesday, November 19, 2013 10:52 AM
To: DNR Waukesha Diversion App
Subject: Diversion Comments

Dear Sir or Madam,

We write to you with concerns about the diversion of Lake Michigan water for use in Waukesha. We understand a technical review and environmental impact statement of Waukesha's application is underway and we hope the following issues will be taken into consideration.

- The City of Waukesha has not made a compelling case that it is without a reasonable local water supply alternative and, therefore, it does not need a diversion.
- The City seeks water for a greatly expanded service area that includes communities or portions of communities that have their own adequate supplies of potable water;
- The City does not fully employ conservation measures available to reduce its water need;
- The City proposes to discharge treated wastewater into a waterway that is already impaired by pollution and does not demonstrate how this would comply with the requirements of the Clean Water Act.

We look forward to learning more about this process and ways to ensure our natural resources are used wisely. Thank you for your consideration.

Respectfully,

Paul & Wendy Greeney
711 W. Haddonstone Place
Mequon, WI 53092

Lang, Kassandra M - DNR

From: James Oliver <jamesfourwinds@yahoo.com>
Sent: Wednesday, November 20, 2013 2:17 PM
To: DNR Waukesha Diversion App
Subject: comment on Waukesha water diversion plans

Categories: Red Category

Hello,

My name is Jim Strom and I would like to comment on the diversion of Lake Michigan water to Waukesha. I attended the presentation in Oak Creek and I was not convinced that the city of Waukesha has done enough to conserve water and live with what is left of their water wells supplies.

I was concerned about a plan in place to have radium contaminated water from Waukesha deep well water released into the Root River during an emergency. They claim that they won't use the deep well water unless in an emergency. They have been sending radium contaminated water into the Fox River system. They could use this system to dilute any number of chemicals from future businesses into the Lake Michigan ecosystem.

Four Conditions for the Waukesha Water Bailout

By Ken Hall
Racine County Supervisor

Should Lake Michigan water be sent outside the watershed to Waukesha and if so, what should be expected back? Let's consider this, but for now the bailout should be rejected.

The great lakes are a gift from the last ice age and this endowment is 21% of the world's fresh water. This treasure is ours to use and steward, for our descendants, and for the animals and plants that share the interconnected web of what's left of this degraded ecosystem. There are depleted fisheries, alien species, pcb and mercury contaminations, fertilizer run off, and more. But there's water, and the job of the great lakes compact is to sustain it.

Sitting on a deep aquifer that it has sucked dry, Waukesha water practices can't go on. They chugged their endowment over the last century and then flushed it down the Fox River to the Mississippi. Bad luck, bad practices, short-term thinking, they'd cry a river if they could.

Today's reality is that Lake Michigan counties, like Racine, have water. It is reasonable for those in the great lakes basin not to compromise the asset and that means tough conditions for water takers, especially for those with low stewardship credibility.

Waukesha argues for a water bailout under the great lakes compact over thousands of pages,

- Timely and self-reliant steps to protect their aquifers were not done and the water conservation program in the application adds up to promises for later.
- Their wells are so deep that water comes out laced with radium and there's a looming federal deadline to fix that.
- The \$206 million plan to buy Lake Michigan water from Oak Creek and recycle it down the Root River means Waukesha, Pewaukee, Delafield, Genesee, and others can keep growing.
- The Root River return is the cheapest option the DNR allowed, by \$19 million.
- Waukesha claims every drop will return to Lake Michigan, treated to standards cleaner than the current river while raising its level some.

Waukesha talked about improving the environment and public health at the water bailout pitch and some of that may happen, but their application is not sufficient or credible and should be rejected. At least four conditions for the water bailout are missing:

1. No bailout until Waukesha water conservation efforts cut water use by 6%. Projecting 10% savings by 2050 is too slow (37 years to fix toilets & showerheads?).
2. Costly penalties up to and including cutoff for not returning all water taken, as promised.
3. Payments (per gallon returned) for use of the Root River matching what Oak Creek is getting for supply, to divide between Caledonia, Racine, and Racine County; with use restricted to wetland, river, and water quality improvement efforts.

4. Down payment of at least 2% of capital costs to endow local water improvement organizations and projects with a mission to improve the Root River and Lake Michigan.

These conditions provide means to hold bailout recipients to their promises, while adding the hedge of increased watershed restoration deeds. Significant efforts are underway, but more work is needed as water use increases.

Adding water users multiplies risks. Extra phosphorus in the river likely means higher concentrations and more algae blooms at the lake; so too may unregulated substances lead to overdose: from estrogen and other hormones that toy with fish and amphibian reproduction, to Ritalin, Viagra, insulin, steroids, morphine derivatives, anti-depressants, senility drugs, and more all pumped unfiltered (effects unstudied) into the veins of the river flowing to the lake.

The first water bailout sets precedent, what could go wrong? A diversion without accountability will bleed the great lakes and/or toxify them by adding contaminants in each reuse. Multiply that by the prospects spread over eight great lake states and Canada and the importance of high standards comes into focus. Given watershed risks, a conservative policy of "no bailouts for outsiders" sounds right.

Waukesha founders started with bubbling water, they called it "Spring City" and people flocked to healing spas. Recently, the city was named one of our nation's 100 best, but this ranking takes sustainable water for granted. The days of doing that are over, just like those Spring City spa days, and that's why conservation, cutoff accountability, and a funded resource restoration formula are minimum conditions for any great lakes water application.

Supervisor Ken Hall attended the Waukesha Water Diversion Hearing at Gateway and then provided these public comments (DNRWaukeshaDiversionApp@wisconsin.gov). The DNR will accept inputs until December 2, 2013. Contact: Ken.Hall@goracine.org. 262-898-9741.

Lang, Kassandra M - DNR

From: Mike.Pjevach@coachusa.com
Sent: Friday, November 22, 2013 4:17 PM
To: DNR Waukesha Diversion App
Subject: Waukesha Water Application

Categories: Red Category

To whom it may concern,

Please accept this e-mail as supportive of the Waukesha Water application. The fact that Waukesha's current water source has high levels of radon and is under orders from the EPA to reduce the levels is undisputed. It is because of this health risk, that an alternative source is needed. After reading lots of information and attending many meetings, the Great Lakes option is the best and most environmentally sustainable solution. The massive amount of time has been invested to develop the application after looking at other options. The application is thorough and the plan to source the water and return flow is solid. There is much misinformation about the plan being talked about by those who oppose the application. I am confident that the DNR reviewers will use facts in your evaluation of the application.

I hope that the DNR approves the application, so it can proceed to the next approval level. The EPA deadline is quickly approaching.

Sincerely,

Mike Pjevach
Phone: (262) 853-8347
Fax: (262) 477-4734
E-mail: Mike.Pjevach@CoachUSA.com

This email has been scanned by the Symantec Email Security.cloud service.

Lang, Kassandra M - DNR

From: margaret mary gerhard <fullmoonbog@gmail.com>
Sent: Friday, November 22, 2013 5:14 PM
To: DNR Waukesha Diversion App
Subject: Waukesha Diversion Application

Categories: Red Category

i say no to the lake water being diverted to waukesha!-

Lang, Kassandra M - DNR

From: Janice Siska Hjelmgren <gianatam@care2.com>
Sent: Sunday, November 24, 2013 11:40 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Categories: Red Category

Dear Mr. Eric Ebersberger:

I am extremely concerned that Waukesha, once renowned for its pure spring water that it shipped out and away cannot use its own water for its citizens due to contamination from a fallen water table. Water is not supposed to be lost from the water cycle - yet more and more communities are following in Waukesha's footsteps and bottling up their water and shipping it out and losing it from the replenishment of their water tables. This pattern needs to stop - we need to plan for renewal and not replacement from somewhere else, because there is nowhere else to go.

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. Waukesha simply hasn't proven that the water needs of the area couldn't be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Additionally, the Department must fully evaluate the environmental impacts locally and downstream on the Fox River and its associated ecosystems. Water quality and quantity in that system cannot be overlooked in this process.

Finally, the Compact requires that as much of the water returned to the Basin originate from within the Basin as possible, and that the "return" of water from outside of the Basin is minimized. There are good reasons for this requirement; for example, it reduces the potential for contaminants to enter into the Basin. However, information from Waukesha suggests that well over one-third of the water it would send back to Lake Michigan under its preferred diversion and return flow plan will be water from the Mississippi Basin. I am concerned this excessive volume of out-of-Basin water violates the requirements of the Compact.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,

Janice Siska Hjelmgren
141 S Lakeshore Drive
Racine, WI 53403

Lang, Kassandra M - DNR

From: Lang, Kassandra M - DNR
Sent: Wednesday, November 27, 2013 8:09 AM
To: DNR Waukesha Diversion App
Subject: FW: DNR Website Information Request: Drinking Water and Groundwater

Categories: Red Category

From: Ebersberger, Eric K - DNR
Sent: Monday, November 25, 2013 5:44 PM
To: Pfeiffer, Shaili M - DNR; Lang, Kassandra M - DNR
Cc: Clayton, Nicole L - DNR; Smail, Robert A - DNR; Fuchsteiner, Christopher J - DNR
Subject: FW: DNR Website Information Request: Drinking Water and Groundwater

FYI

From: Damgaard, Marjorie S - DNR
Sent: Monday, November 25, 2013 10:54 AM
To: Ebersberger, Eric K - DNR
Subject: FW: DNR Website Information Request: Drinking Water and Groundwater

From: dodehans@aol.com [<mailto:dodehans@aol.com>]
Sent: Monday, November 25, 2013 9:54 AM
To: Damgaard, Marjorie S - DNR
Cc: DNR WEB FEEDBACK
Subject: DNR Website Information Request: Drinking Water and Groundwater

The Referring URL: <http://dnr.wi.gov/topic/wateruse/waukeshadiversionapp.html>

The City of Waukesha water application does not address the Niagara Dolomite rock shelf in the Town of Genesee, yet they say they will supply water here in their 'back-up plan'. Their back-up plan calls for drilling 10 or 12 shallow wells into our aquifer and taking 10,000,000 gallons of water PER DAY; more than 1600 homes will then have their pumps hanging in mid-air. How are they then going to get water mains thru solid rock below the frost lines. Our property in the Town of Genesee is assessed at over \$500,000. What will it be worth without water? There are DOZENS like us. Shaili Pfeiffer should call me; I am Hans Hamm @ 262-547-5984. We cannot afford to have our 6-1/3 acres become a dog park.

Contact Information:

Name: Hans Hamm
Phone: 262-547-5984
Cust#:
Reg#:
Email: dodehans@aol.com

Lang, Kassandra M - DNR

From: Mercedes Dzindzeleta <mdzinger@att.net>
Sent: Monday, November 25, 2013 9:10 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Categories: Red Category

Dear Mr. Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am very concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and I am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application. The Compact says these water conservation measures must be implemented before any diversion takes place. Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to-date.

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, IT IS done in many other parts of Wisconsin and elsewhere around the nation. Waukesha simply has not proven that the water needs of the area could not be met through some combination of local water sources, especially when used in conjunction with a wholehearted CONSERVATION effort. CONSERVATION needs to be the biggest priority for Waukesha County; next is the mixing of waters to reduce radium.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, PLEASE ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

NEED to make Conservation the active ingredient before trying to do the "easy way" of getting more water from others. The Great Lakes, especially Lake Michigan, are at low times; now is not the time to divert more of it.

Thank you,

Mercedes Dzindzeleta
609 7th St

Racine, WI 53403

WAUKESHA WATER UTILITY
CITY OF WAUKESHA, WISCONSIN
Public Briefing on Great Lakes Water Application

PUBLIC COMMENT FOR DEPT. OF NATURAL RESOURCES

November 18, 2013

RECEIVED-DNR

NOV 25 2013

DRINKING WATER & GW

Waukesha's application is currently being reviewed by the Wisconsin Department of Natural Resources. If you want to provide comments to the DNR, you may drop this completed form in the **COMMENT BOX** or you may mail it to the DNR at Wisconsin DNR, DG/5, PO Box 7921, Madison, WI 53707-7921, Attention: Kassie Lang, no later than December 2, 2013.

Date: 21 Nov 2013

Name: C. TODD ZAKRESKI - President, HUSCO AUTOMOTIVE

Address: 2239 Pewaukee Road, Waukesha, WI 53188

Who you represent: HUSCO International

Comment: I support the City of Waukesha's revised application, as proposed, to obtain water from Lake Michigan, which was submitted 14 OCT 2013. I believe the application is the best environmental decision for the region, as it will have no impact on Great Lakes levels; will improve the quality and level of return flow in the Root River, and provides Waukesha with a safe and reliable water supply for the long term.

C. Todd Zakreski

HUSCO Automotive

Waukesha County Business Alliance Board Member



LEAGUE OF WOMEN VOTERS® OF WISCONSIN EDUCATION NETWORK

612 W. Main Street, #200
Madison, WI 53703-4714

Phone: (608) 256-0827
<http://www.lwwwi.org>

November 26, 2013

To: Eric Ebersberger, Section Chief, Wisconsin Department of Resources

Re: Waukesha water diversion proposal

The League of Women Voters of Wisconsin advocates for great caution in your consideration of the proposal by the City of Waukesha to divert an average of 10.1 million gallons of water from Lake Michigan daily to meet its water needs.

A member of the League of Women Voters of the Lake Michigan Region, the Wisconsin League supports preserving and enhancing the environmental integrity and quality of the Great Lakes-St. Lawrence River Ecosystem. We support the Great Lakes Compact, a "responsibility pact" that sets rules for the withdrawal of water from the lakes, and gives bordering communities a say in any decisions to divert water to areas outside the Great Lakes basin.

The water of the Great Lakes is not an infinite commodity. Rain and streams only replenish one percent of the lakes' water each year. The results of over-usage are already seen in the drop in water level in Lake Michigan and other lakes. The lakes are a gift of the retreating glaciers, and once depleted they will not be restored.

We urge you to examine carefully whether Waukesha has met the requirements of the Great Lakes Compact. Specifically, we are concerned that Waukesha has not adequately explored all reasonable alternatives and has not implemented sufficient conservation practices to satisfy the requirements of the Great Lakes Compact.

We do not contest that Waukesha should have reasonable access to water for its current and future needs, including future development within the city limits. However Waukesha should not have the ability to provide water on a contractual basis for other municipalities which have not established a plan for compliance with conservation requirements under state and federal law, as required by the Great Lakes Compact.

Keep in mind that the Waukesha proposal is the first of its kind you are considering. What happens to this proposal will set a precedent for countless future requests from municipalities in all eight Great Lakes states and the two Canadian provinces that border the lakes. The Compact requires that any evaluation of this proposal consider not only the individual impacts of this proposed diversion but the potential cumulative impacts of all future diversions based on the precedent set here.

We believe water conservation should be a high priority of all governments in the basin. We urge you not to approve the current proposal in the absence of firm, complete and detailed plans by the City of Waukesha for minimizing both the certain and the potential environmental impacts of the proposed water diversion.

Thank you.

Lang, Kassandra M - DNR

From: Lucia Petrie <luciapetrie@gmail.com>
Sent: Tuesday, November 26, 2013 9:14 AM
To: DNR Waukesha Diversion App
Subject: comments on Waukesha Diversion

I oppose the Waukesha request for Lake Michigan water for two reasons:

There is no guarantee YET that the water will be returned fully treated. The new plant is step forward, but the diversion should not be approved until there is a fail safe returned implementation of the plan.

Secondly, the current request for Lake Michigan water allows for further development of housing and population in Waukesha. This is like building in a desert. No further housing or commercial should be eligible for the Lake Michigan water diversion. The diversion should serve the current footprint only -

Lucia Petrie
Milwaukee

Lang, Kassandra M - DNR

From: Moths Family <moths@wi.rr.com>
Sent: Tuesday, November 26, 2013 12:12 PM
To: DNR Waukesha Diversion App
Subject: Root River Tributary

Hello,

I read the article in the Milwaukee Journal Sentinel (11/24/13) and have a question regarding releasing water back into the Root River. Our property is at 2300 S. Meadowlark Drive in New Berlin. A tributary of the Root River circles our property. There is serious flooding maybe once a spring, and some years there is no flooding. Will the plans for the wastewater release to the Root River increase either the frequency, duration or intensity of the flooding on our property?

Please respond.
Thank you,

Virginia Moths

moths@wi.rr.com

262-617-8666

2300 S. Meadowlark Drive
New Berlin, WI 53151

Lang, Kassandra M - DNR

From: Mark M Giese <m.mk@att.net>
Sent: Tuesday, November 26, 2013 12:38 PM
To: DNR Waukesha Diversion App
Subject: Waukesha's application

Waukesha's application to divert Lake Michigan water has some deficiencies:

They have not made the case they are without a reasonable local water supply alternative.

They do not fully employ conservation measures.

They seek water for an expanded service area.

They seek to discharge water into an impaired waterway.

Please be sure such deficiencies are addressed.

Thank you.

--Mark M Giese
1520 Bryn Mawr Ave
Racine, WI 53403

Lang, Kassandra M - DNR

From: Pdxdiane@aol.com
Sent: Tuesday, November 26, 2013 5:21 PM
To: DNR Waukesha Diversion App
Subject: Lake Michigan water

Categories: Red Category

to Waukesha. This is a bad idea because the folks there will continue to develop their county and we will continue to supply more and more water from Lake Michigan, which is already at historic lows.

Diane Buck
3559 N. Summit Avenue
Shorewood, Wi. 53211

Lang, Kassandra M - DNR

From: Lang, Kassandra M - DNR
Sent: Wednesday, November 27, 2013 8:11 AM
To: DNR Waukesha Diversion App
Subject: FW: Comments on the Waukesha application for Great Lakes diversion
Attachments: Comments on the City of Waukesha application - Final.doc; OUR_WATERS_Spring2012_Sustainable_Supply.pdf; June 2011 rebuttal to DNR written by DSC.doc

Categories: Red Category

-----Original Message-----

From: Ebersberger, Eric K - DNR
Sent: Tuesday, November 26, 2013 2:42 PM
To: Lang, Kassandra M - DNR
Cc: Clayton, Nicole L - DNR; Smail, Robert A - DNR; Fuchsteiner, Christopher J - DNR
Subject: FW: Comments on the Waukesha application for Great Lakes diversion

FYI

-----Original Message-----

From: Douglas S Cherkauer [<mailto:aquadoc@uwm.edu>]
Sent: Tuesday, November 26, 2013 2:30 PM
To: Ebersberger, Eric K - DNR; Pfeiffer, Shaili M - DNR
Cc: Tim
Subject: Comments on the Waukesha application for Great Lakes diversion

Eric and Shaili,

Attached please find some comments that Tim Grundl and I would like you to consider as you review Waukesha's application for a diversion of Lake Michigan water. In addition, I am attaching 2 other documents that relate to our comments: a memo from June, 2001, to the review team at that time, and a document from UWM's Our Waters series that relates to sustainable water supply and the role that riverbank inducement might/can play.

We would be happy to discuss these items with you should you have questions or seek amplification. We can both be reached at the email addresses above. Tim can be reached at UWM at 414-229-4765 or at the WATER Institute at 414-382-1744. The best number for reaching me is my home phone - 262-628-3672.

I will also send you hard copies of these items.

Doug Cherkauer

**Comments on the City of Waukesha application
for a diversion of water from Lake Michigan**

**D. S. Cherkauer, Professor Emeritus of Geosciences
T. J. Grundl, Professor of Geosciences**

**University of Wisconsin-Milwaukee
November 27, 2013**

I. Preface

It is our understanding that the role of the Wisconsin Department of Natural Resources (WDNR) in an application for a diversion of water from the Great Lakes Basin is to thoroughly review the documentation provided by the applicant. If the WDNR finds the documentation convincing, its task is then to present to the other States an argument for that diversion. We have reviewed the documentation which the City of Waukesha has supplied and find that we have some scientific concerns with the materials that, in our opinion, still need to be addressed. Because this is the first application for a diversion under the Great Lakes Compact, it will be very carefully scrutinized and it is of paramount importance that a balanced and scientifically robust argument is presented. It should be clear that our sole intent in presenting these concerns is to assure that this is the case. We are making no judgment on the overall merit of the application.

Our concerns fall in two categories: those that have implications throughout the entire analysis of alternative water sources, and, those that address specific points presented in the analysis of alternatives as presented in Volume 1 (Application Summary) of the Application.

For clarity, let us state that we are using the term “shallow aquifer” in our comments to represent what the Application is calling at various points Troy bedrock valley aquifer, shallow aquifer, Fox Valley alluvium and dolomite aquifer. These hydrogeologic units are all part of what is known regionally as the shallow aquifer or Glacial/Silurian aquifer. These units are all hydrologically connected and function as a single regional aquifer.

II. Concerns with broad implications in the application

We have three overarching concerns which affect the narrative presented in the Application Summary (Volume 1 of 5) and its supporting documents. The concerns are outlined below with supporting detail in the following narrative.

A. A failure to adequately address riverbank inducement (RBI) as a viable water source.

- RBI wells need to be close to a surface water body. Many of the wells identified in the Application as RBI are too far from the Fox River to successfully induce water to them.
- A maximum of only 4 wells that have been proposed are close enough to the river to function for RBI.

B. Concerns we have about the simulation of drawdowns in the shallow aquifer,

- The model used to simulate the shallow aquifer appears to be greatly overestimating drawdowns in Alternatives 1, 3, 4 and 6.
- It appears unlikely that neither the wells nor the aquifer can sustain the pumping being simulated.
- The overestimated drawdowns will, in turn, generate high values for the apparent baseflow reductions.
- No reference is made to an alternative model that has been developed by the USGS which suggests much more water can be induced from the Fox, with much lower drawdowns and baseflow reductions.

C. Apparent confusion about the calculation of baseflow reduction methodology.

- The method being used was developed by Cherkauer for use in a regional scale analysis of water supply and impacts.
- Use at the smaller scale relevant to the Application requires a slightly different approach presented below.

A. Failure to adequately address riverbank inducement as a viable water source

Riverbank inducement (RBI) is a process to conjunctively utilize groundwater and surface water as a water source. When wells are placed in a shallow aquifer near a surface water body, they can, under the right hydrogeologic conditions, draw part of their water from surface water induced by pumping to flow into the aquifer and part from groundwater (Figure 1). The latter would flow into the river as groundwater discharge before pumping but is now intercepted before it reaches the surface water body. This method is widely used in both the US (Louisville, Dayton, Des Moines, Cedar Rapids, and many more) and Europe. It has the advantage that it reduces the stress on the aquifer because the amount of intercepted water being pumped is less than the groundwater that would be pumped if the well were not located near a surface water body.

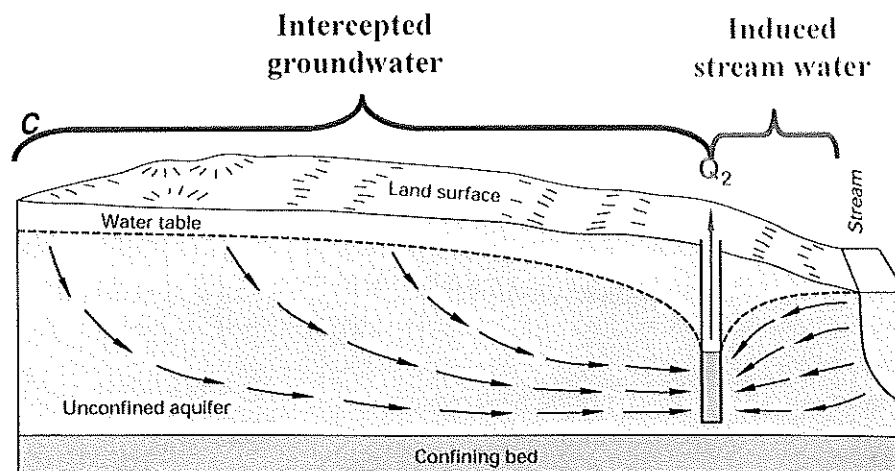


Figure 1 Schematic diagram showing the sources of water for a pumping well near a surface water body. The discharge to this well (Q_2) is from two sources:

$$Q_2 = Q_{\text{intercepted}} + Q_{\text{induced}}$$

Successful development of a riverbank inducing well field requires:

1. A hydraulic connection (hydraulically conductive material) between the stream and the aquifer. This connection can be three-dimensionally complex, rather than the simple, direct connection shown in Figure 1 or in Exhibit 11-2 of Volume 2 of the Application.
2. Wells close enough to the stream that the drawdown from their pumping will reverse the gradient so that it becomes continuously directed toward the well from the stream. Some communities actually install horizontal collector wells under a surface water body to increase the proximity of their wells to the surface water body (as shown in Exhibit 11-2 of Volume 2).

In Figure 1, water is being removed from the stream (representing any surface water body), a situation that could reduce the stream's flow, a particular concern at baseflow (low flow). Minimization of the impact of inducing wells on a surface water body is as simple as returning the pumped water to that same surface water body. This returns both the water induced out of the body and the groundwater that would previously have flowed into it, keeping overall impacts on baseflow small.

The location of the well field relative to the return point (usually as treated effluent from a wastewater treatment plant - WWTP) will also affect the magnitude and distribution of the impacts on the surface water body. If the well field is downstream along a river from the WWTP, baseflow will actually increase between the WWTP and the well field and then return to its pre-pumping volume below the well field. If the well field is located upstream from the WWTP, then baseflow will decrease between the wells and the WWTP. In each case, the change in flow in the river due to the well field will be only the amount of water being pumped from the wells.

If the well field is not on the same water body as the WWTP (in another watershed or a tributary to the main river), then the impacts to baseflow in the two waterways will be parallel to transfers between basins. Typically, this will be a baseflow reduction in the river with the well field and baseflow increase below the WWTP on the receiving river.

[Note: Waukesha's current pumping from the deep confined aquifer with discharge of treated wastewater to the Fox River is a transfer between water bodies. It has contributed to the large drawdowns in the deep aquifer, which are a primary driving force for this Application, and it has also increased the flow in the Fox River below the Waukesha WWTP by the amount the city is pumping from the deep aquifer.]

Waukesha's application for a diversion identifies the well field they propose along the Fox River ("Fox River alluvium") as an RBI field. However, some of those wells fail to meet the second criterion listed above for the successful development of RBI - the wells are too far from the river to develop sufficient drawdown in an unconfined aquifer to reverse the hydraulic gradient. Of the locations shown in the Application (Exhibit 11-18, Volume 2) 4 of the 7 are over a quarter mile away from the river. The result is that the RBI option presented in the Application is very minimalist. It includes only 4 wells near the Fox River in Alternative 3 and 5 in Alternative 6.

In both cases, that minimal RBI option was paired with numerous wells installed along Pebble Brook, a small tributary to the Fox and also a major source of water for the Vernon Marsh. Pumping wells along Pebble Brook has the effect of creating undesirable drawdowns in areas where homes use private wells for their supply. It also intercepts much of the normal groundwater discharge to Pebble Brook and thus to Vernon Marsh. The coupling of the limited RBI wells with those along Pebble Brook unfortunately creates a situation where RBI gets overlooked because the Pebble Brook wells generate very undesirable impacts.

We understand Waukesha's concerns about the potential for some recycling of contaminants from upstream WWTPs through more extensive use of RBI as an alternative source. However, Waukesha wells 11 & 12 are already inducing on the order of 30% of their water from the river (Thorp, 2013). We believe that RBI needs to be given a more thorough analysis as the source of shallow aquifer water in the Application. We also believe that its viability should be assessed using a flow model designed to simulate groundwater/surface water interactions and in scenarios that do not pair it with wells placed along Pebble Brook.

B. A need to re-examine the simulation of groundwater in the shallow aquifer

In our review of the Application, we have noticed that the calculated drawdowns in the shallow aquifer in Alternatives 1, 3, 4 and 6 and presented as Exhibits 11-8, 11-18, 11-19, and 11-36 in the Waukesha Water Supply Service Area Plan (Volume 2 of 5) seem unrealistically high. It appears that the water table would be drawn well into the

Silurian dolomite. The large drawdowns result in the impacts associated with shallow aquifer drawdown being overstated throughout the Application.

While we do not have access to the letter report on groundwater flow modeling from RJN Environmental Services dated August, 2013, we have seen earlier versions of the report and are familiar with the Troy Bedrock Valley (TBV) model (Jansen and Loughry, 2009) used to do the simulations. This model was developed to assess the TBV as a viable water source. The TBV is located 2 to 4 miles to the south barely crossing the southern boundary of the Town of Waukesha (Figure 1, Jansen and Loughry, 2009). The Lathers property and Pebble Brook may lie in small valleys tributary to the TBV, but that is not obvious in the Jansen and Loughry report.

The TBV model has identified the layers which are pumped as a water source as being always confined. For the current unstressed (unpumped) situation, this may be appropriate. However, it can create problems if the model is used to simulate heavily pumped scenarios, such as those that are proposed along the Fox and Pebble Brook in alternatives 1, 3, 4 and 6, particularly if those well fields lie outside the main channel of the TBV, where the unconsolidated part of the shallow aquifer is relatively thin.

In the modeling program MODFLOW, water levels in a layer designated as confined only are calculated using the pumping rate and the layer transmissivity (product of layer thickness and hydraulic conductivity). The program never compares the calculated elevation of the groundwater to either the top or bottom of the layer. Consequently, under heavy pumping, the program can calculate water levels that are actually near or below the bottom of a pumped layer. This situation is no longer confined, but that condition is not recognized by the model. In fact, we believe that the drawdowns calculated by the TBV model for some of the wells proposed by Waukesha are many hundreds of feet. In the real world, the pumping wells would have long gone dry, but the program doesn't shut them off. The end result is that the modeled output shows excessively high drawdowns (even on the smoothed contour maps presented as Exhibits 11-18 and 11-19, Volume 2) and also suggests that the simulated wells can produce far more water than their real counterparts could.

The effect of this mis-simulation of wells in the well fields is two-fold. First, the excessive drawdowns induce more water from surface water bodies than is realistic. The result is an overstatement of the possible impacts of the wells - in terms of both drawdown and baseflow reduction. Second, the simulation also gives the false impression that the well fields can supply more water than either the real aquifer or the simulated wells can deliver.

Another numerical model for the shallow aquifer in the area of interest exists, the Upper Fox Watershed model. We present it below along with results from simulations in which we have placed wells along the Fox to test the viability of RBI by itself, not in combination with wells in other locations. The model is also described in Cherkauer, Grundl & Feinstein (2011).

1) Description of the Upper Fox Watershed model

A model to simulate groundwater/surface water interactions in the Upper Fox River watershed was developed by D. Feinstein of the US Geological Survey (Feinstein, et al, 2012). It is fully documented in that report, but some aspects will be highlighted here. The Upper Fox model is based on an entirely different conceptual model for the area's hydrogeology than the TBV model. It uses all viable geologic logs from well construction records archived by the WDNR and the Wisconsin Geologic and Natural History Survey (WGNHS), putting their reported geology into the model cells where logs exist. For the many cells where there are no logs, the model's geology has been obtained by interpolating from the nearest existing logs. Because in many instances there are multiple logs equidistant from a vacant cell, two different versions of the geology have been generated and put into two independent versions of the Upper Fox model. One, the fine-favored model, emphasizes the finest-grained material found in the closest logs. The second, the coarse-favored model, emphasizes the coarsest material. In our view, these two versions of the model, each of which have been fully and independently calibrated, provide an estimate of the entire range of groundwater responses to the stress of simulated wells.

The model differs from the TBV model in several other key aspects:

- It is specifically centered on the Upper Fox River and designed with very small cells (150 feet on a side) and very thin upper layers to provide a high-resolution simulation of the interaction between the river and the shallow aquifer.
- All layers have been simulated as confined/unconfined – no cell is strictly confined. This means that MODFLOW calculates the head in a given cell, compares that head to the elevation of the top of that cell, internally decides if the cell is confined or unconfined, and then uses that information in its calculations.
- Baseflow in all perennial surface water bodies in the Fox model is routed through the whole flow system. This means that the baseflow at any model cell is the cumulation of the net groundwater discharge to that cell from the aquifer and the baseflow entering the cell from upstream in the river. The average discharge from each of the WWTPs in the Upper Fox (Sussex, Brookfield and Waukesha) is also entered into the model at the plant's discharge point and then routed downstream as baseflow.
- Lastly, the Fox model uses the relatively new Newton solver, which has the huge advantage over previous solvers that it can simulate what the lower limit of sustained pumpage is for a given well at a given location. It does not allow simulated wells to go dry or return anomalous drawdowns (a common problem with previous model solvers); it simply reduces the well's discharge until the well remains viable.

2) Using the Upper Fox Watershed model to test the local viability of RBI

Both versions of the Fox model were calibrated against known water levels, river baseflows and gradients (Feinstein, et al, 2012). In addition, they were compared to field observations in and around Waukesha's well field along the river (Wells 11, 12, 13). They reproduced the geochemically determined amount of river water in wells 11 & 12 (40% and 35%, respectively; Thorp, 2013), the travel time for river water to reach those wells, vertical hydraulic flow patterns beneath the river and the expected pattern of movement of water from the river to the wells (Cherkauer, 2011). So we believe the conceptual model upon which they were designed is valid even under the highly stressed conditions currently observed in the aquifer.

The model versions were then used to simulate a well field to test the viability of river bank inducement near Waukesha. A total of 27 wells were simulated at locations along the Fox River, 15 upstream from the Waukesha WWTP and 12 downstream. All were located in areas where we believe the geology has the potential to allow inducement, and also outside the 100-year floodplain. It is important to note, however, that no field investigations have been conducted on any of the sites, no assessment of access rights have been made nor have the placement or pumping rates of the wells been optimized. This simulation is simply a test of hydrologic viability.

Each well was input into the model at a pumping rate of 0.67 million gallons per day (mgd). If a given location couldn't sustain 0.67 mgd, the Newton solver determined how much to reduce pumping to achieve a sustainable rate. If a well could sustain 0.67 mgd, however, no attempt was made to increase pumping to see what an upper limit might be. This means that the sustainable pumping determined for the well field is actually a lower limit.

The twelve wells simulated downstream from the Waukesha WWTP were asked to produce 8 mgd. Both versions of the model produced similar results, with the coarse-favored being able to sustain a bit more pumping and induce a bit more river water. The fine-favored model is therefore more conservative, so its results will be presented.

In that version, the wells downstream could sustain a minimum of 6.1 mgd (76%), and 39% of that (2.35 mgd) was induced from the river. This percentage of river inducement is very close to what Waukesha wells 11 & 12 are inducing at present, although the river water takes years to reach the wells because it seeks out the path of least resistance (coarse sediments) through which to travel. The 15 wells upstream from the Waukesha WWTP, could only sustain a pumping rate of 3.0 mgd, 30% of what they were asked to produce.

The simulation of a hypothetical well array allows us to make generalizations about the viability of RBI along the Fox. First, it indicates that hydrogeologic conditions upstream from the WWTP are not very conducive to RBI and should not be pursued. In contrast, however, downstream conditions appear quite favorable. A full analysis of this potential alternative water source would require installing more wells along the

downstream Fox and also optimizing the pumping rates of those already in the simulation.

The downstream location of RBI wells has two additional, important advantages over upstream locations. It minimizes the potential of locating such wells near known contamination sites (Exhibit 4-4, Volume 2), and it eliminates any significant new reduction of baseflow in the Fox River. Both the groundwater that is intercepted by the downstream wells before reaching the Fox and the water induced out of the Fox will ultimately be transported to the Waukesha WWTP and returned to the river upstream from where it is removed. Baseflow will actually be increased at the WWTP by the amount of intercepted water, but that increase will decline downstream, becoming essentially zero as the river passes the lowest well in the field.

[Note: Under this scenario, Fox River baseflow will still decline from today's rate by the amount of water currently being transferred by Waukesha from the deep aquifer to the river. That amount has not been factored into the calculation of baseflow reductions, nor should it be.]

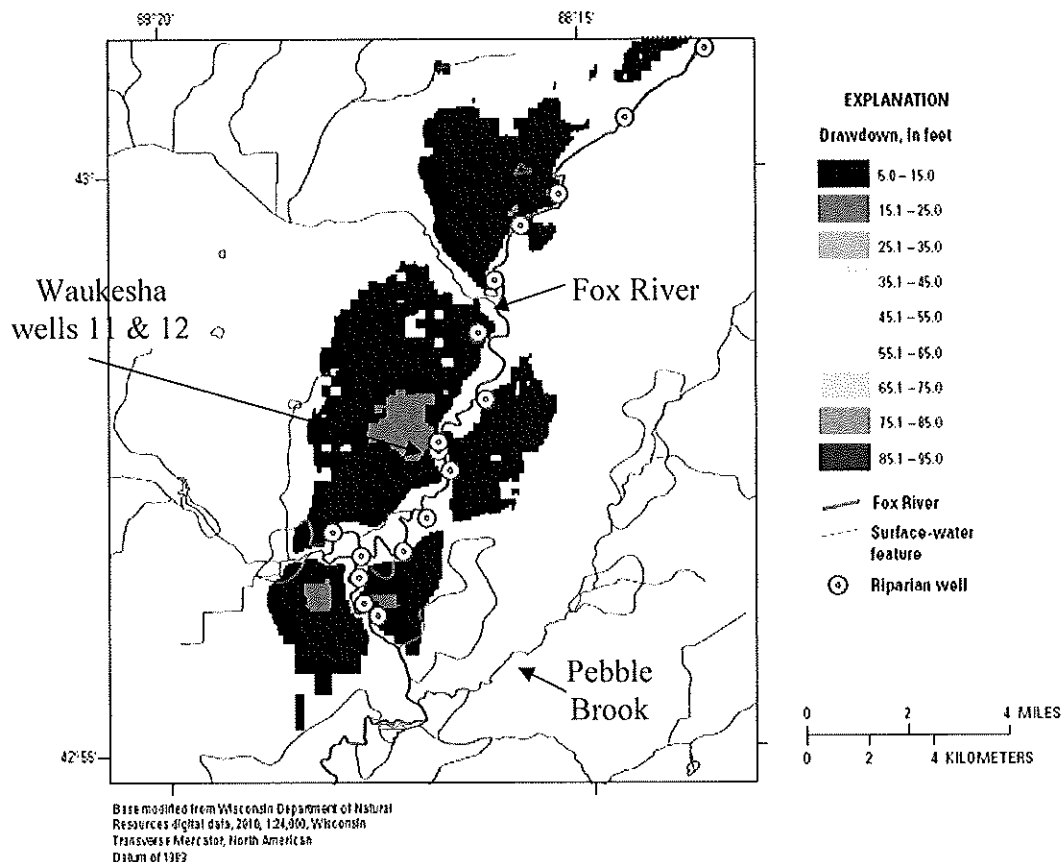


Figure 2 Distribution of drawdown of the water table along the Fox River when RBI is occurring. This is the simulation using the fine-favored version of the Fox River model when all hypothetical wells are active and the riverbed is given the calibrated hydraulic properties. The blue lines are drainages and wetland outlines.

The use of RBI wells along the Fox also greatly reduces the drawdown in the shallow aquifer. We cannot compare our simulation directly to those in the Application, because in its current configuration our well field is drawing a different amount of water than the Application simulations for Alternatives 1, 3, 4 and 6. But Figures 2 and 3 allow comparison of how the drawdown pattern looks when RBI occurs in the simulation (Figure 2) with what drawdown would look like if the river bed were impermeable and riverbank inducement were negligible (Figure 3).

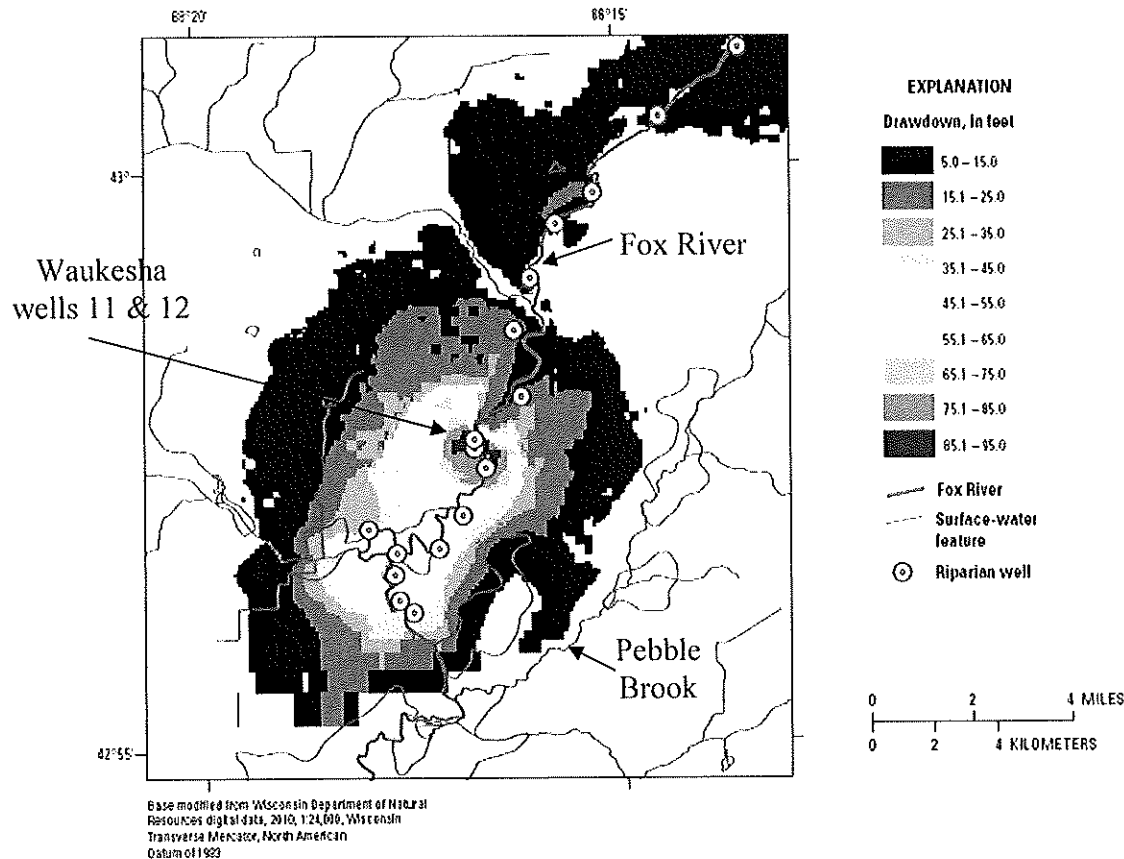


Figure 3 Distribution of drawdown of the water table along the Fox River when RBI is inactive. This is the simulation using the fine-favored version of the Fox River model when all hypothetical wells are active and the riverbed is given very low hydraulic conductivity. The blue lines are drainages and wetland outlines.

In the simulations shown in Figures 2 & 3, the entire field of RBI (riparian) wells is pumping 9.15 mgd, slightly less than the 10.9 mgd being simulated for Alternative 3 in the Application. Exhibits 11-18 and 11-19 in Volume 2 of the Application show the drawdowns resulting from pumping 10.9 mgd from the TBV model. The drawdowns with RBI allowed (Figure 2) in our simulations are not as deep and not as areally extensive. For example, drawdowns in Exhibit 11-18 reach maxima of about 90 feet, while the Fox model maximum drawdowns in Figure 2 are less than 25 feet. The large

contrast in the drawdown pattern shows the benefits of RBI with respect to reducing impacts of public-supply pumping on local surface water and nearby private wells.

The Fox model has taken into account a variety of conditions conducive to the viability of RBI, including leakage from the river, the spatial complexity of the glacial sediments, and the location of wells along the Fox itself rather than along Pebble Brook. Comparing Figures 2 & 3 demonstrates that the simulated system must be able to induce water from the Fox River in order to prevent excessive drawdowns.

Table 1 provides a comparison of the baseflow reductions calculated with the Fox model and those cited in the Application from the TBV model. Because the Fox model has placed wells along the Fox River, the RBI option induces notably more water from the river than the Alternatives presented in the Application. To allow a better understanding of the effect of the wells alone on the river, the baseflow reductions for the Fox are presented without inclusion of the effluent return upstream. In all cases, the baseflow reduction shown will be eliminated by that effluent return.

For the tributary streams, the RBI option has much smaller baseflow reductions than all the Alternatives considered in the Application, except for Alternative 6, where only 2.7 mgd are being pumped from the shallow aquifer. Pebble Brook, Mill Brook and Mill Creek all flow into the Vernon Marsh, so the RBI option would have a much smaller impact on that large wetland system.

Table 1 Simulated baseflow reductions from both the Upper Fox and Troy Valley models

	Troy Bedrock Valley model				Fox RBI model	
	Alts 1 & 4	Alt 3		Alt 6	Fine-favored	Coarse-favored
		14 wells	27 wells			
Pumping (mgd)	6.4	10.9	10.9	2.7	9.2	9.6
Exhibit in App.	11-9	11-20	11-21			
Fox River *	5 *	11 *	7 *	3 *	14.7 *	15.8 *
Pebble Brook	34	34	45	2	5.8	4.7
Mill Creek	33	26	44	1	2.6	0.4
Mill Brook	85	77	100	53	ND	ND
Pebble Creek	0	13	0	NR	4.6	7.3

All baseflow reductions are presented as %s.

* Fox River values are presented as simulated loss without treated effluent return.

This allows direct comparison between the models, because the TBV values were calculated that way. In the Fox model, effluent was inserted to the Fox at each WWTP.

NR = not reported in Application.

ND = not determined; Mill Brook is not entirely in the Fox model.

We interpret the results of the Upper Fox model as showing that RBI is viable along the Fox River and that it results in notably less drawdown and baseflow reduction than placing shallow aquifer wells along Pebble Brook, as presented in the Application. Relocating the shallow aquifer wells to the Fox downstream from the WWTP also eliminates impacts on baseflow from new wells. In our view, the RBI option could potentially either be used as a source by itself or to replace the wells along Pebble Brook in Alternatives 1, 3, 5 or 6 in the Application. It seems likely that this would strongly reduce the negative impacts the Application assigns to those Alternatives, so we would encourage further examination.

Our efforts to present the Upper Fox model and its results to Waukesha in the past have not been well-received. Similarly, an overture we made to Waukesha in September, 2010, to work together to determine why the Upper Fox and TBV models differ was not accepted. We believe that the differences in drawdowns between the two models are partly the result of the presence of very few real RBI wells (those that lie within the riparian zone of the Fox River) in the TBV simulations and partly due to the defining of the shallow aquifer as strictly confined in the original construction of the TBV model. The very large drawdowns that result from the latter point create strong, but unrealistic, downward vertical gradients (especially along Pebble Brook), which force the model to calculate inducement of water out of the brook. This, in turn, generates very high apparent baseflow losses in Pebble Brook and Vernon Marsh.

C. Addressing confusion over the calculation of baseflow reductions.

Many references to an analysis of baseflow reductions by one of the writers of this commentary (Cherkauer, 2010) appear in this Application. In Cherkauer's report, baseflow reductions were calculated for the composite of all surface water bodies in a given community. This was done in conjunction with a regional water supply plan (SEWRPC, 2010), and the purpose was to get a handle on locations where baseflow would be most reduced within the region. As a result a very broad scale was used for the calculations.

At a smaller scale, such as the individual stream segments used in the Application, baseflow reductions should be handled differently. Baseflow reduction should be calculated as:

$$\text{Baseflow reduction} = \{(Q_{up} + Q_{gw})_1 - (Q_{up} - Q_{gw})_2\} / (Q_{up} - Q_{gw})_2,$$

where Q_{up} = the baseflow entering the segment from upstream,
 Q_{gw} = the groundwater discharge to the stream within the segment, and
 conditions 1 and 2 are the impacted & unimpacted scenarios, respectively.

| At this scale return water from a WWTP should also be accounted for as baseflow. If the return is upstream from the segment, then the return is part of Q_{up} . If the return occurs

within the segment, then it is part of Q_{gw} . In Cherkauer (2010), it is specifically pointed out that that return water was not accounted for in the calculations. Cherkauer apologizes if his publication has misled those developing this Application.

III. Concerns about specific points made in the narrative in the Application.

Perhaps the most efficient way to convey the remainder our concerns is to take them in the order in which they appear within the Application Summary (Volume 1 of 5). Our comments follow with reference to the section in the summary where they appear.

A. Section 2. City of Waukesha Background

In some locations in the report, water levels in the deep aquifer are expressed as depth below ground surface (Exhibit 2-4, for example), while in others areas they are expressed as drawdowns (drop in head from pre-pumping levels). In both cases, a range of values of 400 to 600 feet is quoted, which is misleading. Exhibit 2-4, for example, seems to suggest that a Groundwater Management Area is defined as a location where the water level is greater than 150 feet below the ground surface. In fact, it is defined as an area where drawdown has exceeded 150 feet. This inconsistency should be corrected wherever it occurs.

In Section 2.2.1, reference is made to the potential for increase of TDS in the deep aquifer as heads decline. Other than well 9, have TDS actually increased in Waukesha's deep aquifer wells? And are heads in the deep aquifer wells still declining? Recent data seem to suggest that water levels are either stable or rising (USGS, 2013). If this is the case, then is the TDS issue relevant?

We have several areas within Section 2.2.2 where we think the information provided is unclear or misleading:

1. The aquifer supplying wells 11, 12 and 13 is referred to as the Troy bedrock valley shallow aquifer, but based on Figure 1 in Jansen and Loughry (2009), the Troy Valley is many miles to the south. The aquifer is actually simply a part of the glacial deposits which lie beneath much of the Fox River area.
2. Mention is made that some shallow aquifer test wells have exceeded the drinking water standard for arsenic. How many wells, where are they, how many times were they sampled and what were their arsenic concentrations? We are unaware of any widespread arsenic contamination in this part of the State.
3. We find the statement that "every gallon of water withdrawn from the shallow aquifer comes at the expense of surface water flows (lakes, streams, wetlands)" to be misleading. Wells in the shallow aquifer do intercept groundwater that would have flowed to some surface water body. However, it must be borne in mind that all the water withdrawn from

the shallow aquifer will ultimately be returned to some surface water body. If the body from which water was intercepted and the one to which it is returned are the same, then the impacts are negligible. This was addressed in detail in Part I.A of this report.

B. Section 3. Water Supply Planning

In section 3.5, the maximum daily demand (MDD) is calculated as 1.66 times the average daily demand (ADD). We are unclear whether all that MDD must come directly from the water source or whether some portion of it can be met from storage within the water system.

C. Section 4. Water Supply Alternatives Evaluation

In section 4.1, we wish to point out that the regional water supply study (SEWRPC, 2010) investigated two versions of its preferred option for the region - one in which the city of Waukesha continued to rely on groundwater (albeit with more coming from the shallow aquifer) and a second in which Waukesha was assumed to get a diversion from Lake Michigan. Both versions were determined to be sustainable, in contrast to the statement in the application's text (p 4-1) that the deep and shallow aquifer supplies are both unsustainable.

1) Section 4.3.1 - Alternative 1: Deep confined aquifer and shallow aquifer

We are concerned that several of the environmental impacts listed in the summary are either overstated or misleading. This is largely due to the location of many of the proposed wells in the shallow aquifer along Pebble Brook, a small tributary to the Fox River and also a primary source of water to the Vernon Marsh. In order, our concerns with the environmental impact (EI) bullet points on p 4-4 of the Summary Volume are:

EI Bullet 1 – The most recent water level data from deep aquifer wells (USGS, 2013) show that water levels are now either stable or rising. As a consequence, the concern about arsenic mobilization is minimal. The stabilization/rise is probably the result of Waukesha's own reduction of pumping in the deep aquifer plus the conversion of parts of some nearby straddling communities (New Berlin, Menomonee Falls) from groundwater to lake water. Altogether, actions in these three communities have reduced pumping from the deep aquifer by nearly 7.5 mgd since 2000.

EI Bullet 2 – This point needs to be put into context to prevent its being misconstrued. As is pointed out numerous times in the application, calculations (USGS & WGNHS, 2006) indicate that about 30% of the water being pumped from the communities over the deep aquifer cone of depression (a total of 33 mgd at the time of the calculation) is being induced from within the Great Lakes watershed. At most, Waukesha's contribution to this inducement would be 30% of its current deep aquifer pumping. According to Exhibit 4-2 of Volume 2 of the Application, Waukesha's deep aquifer withdrawals in 2011

averaged 5.74 mgd. As a result, Waukesha may be inducing up to 1.7 mgd to flow from the Great Lakes Basin. It should also be pointed out, however, that Waukesha is not the easternmost community pumping from the deep aquifer. Those communities would be inducing a higher percentage of Great Lakes basin water into the cone of depression, and Waukesha would be inducing a lesser, but unknown, quantity.

EI Bullets 5 & 6 – This point is made frequently in the application, but it is oversimplified and sometimes misleading. The effect on surface waters of pumping wells in the shallow aquifer depends on the local flow system, the proximity of the well to the surface water body, and where the water is discharged after it has been used. What Bullet 5 says is largely correct for the well-field design shown in Exhibit 4-3, but would be completely different if the shallow wells were not located along a small tributary stream (Pebble Brook) which is also a primary source of water for Vernon Marsh. As pointed out earlier in this commentary (sections I.A and I.B), if the shallow wells were located along the main branch of the Fox, an entirely different impact would result. Drawdown in the shallow aquifer would be greatly reduced because some portion of the water pumped from the wells would be induced to flow from the Fox. Baseflow reductions would essentially be eliminated, as long as the wells are downstream from the Waukesha WWTP to which the water diverted from the Fox is returned.

We also have some concerns about the arguments made on long-term sustainability and public health for Alternative 1.

Sustainability Bullet 1 - The recent observations of rising/stable water levels in the deep aquifer suggest this point is somewhat overstated. It would appear that the aquifer can sustain current pumping demands, but probably cannot sustain increases.

Public Health Bullets 2 & 3 – Specifics are needed to justify both points. Are there contamination sites in proximity to the existing shallow aquifer wells or to possible future sites? Relative to arsenic, how many wells at the Lathers property tested above the drinking water standard and what percentage of the samples fell into this category?

2) Section 4.3.2 - Alternative 2: Lake Michigan with return flow

Three points are in order. First, cessation of Waukesha's pumping from the deep aquifer will result in a rise in water levels, but it will not totally eliminate the cone of depression. Some reduced amount of water will still be induced to flow from the Great Lakes basin toward the reconfigured pumping center.

Second, this alternative will result in the transfer of the chloride load from water softening (albeit reduced) from the Fox watershed to Lake Michigan. Virtually all water sources in southeastern Wisconsin are hard, because the local bedrock and the sediments and soils derived from it are rich in calcium and magnesium carbonates, so some softening will continue even with a switch to a Lake Michigan source. It would be useful

if the differences in water hardness were presented in a concise table and if the suggested reduction of chloride discharges were then quantified.

Third, flow in the Fox River will be reduced by the amount of Waukesha's current pumpage from the deep aquifer (5.7 mgd), but not by the amount of pumpage from the shallow aquifer wells. The shallow aquifer water, which is either intercepted by wells before it reaches the river or is induced out of the river, is already being returned to the Fox River upstream at the WWTP.

3) Section 4.3.3 - Alternative 3: Shallow aquifer and Fox River alluvium

The drawdowns in the various shallow aquifers have been calculated in the same fashion as those for Alternative 1. We have the same reservations about them here as we expressed for Alternative 1.

We also have concerns with several points made as bullets listed under environmental impacts (EI), long-term sustainability (LTS) and public health (PH):

EI Bullet 1 - Same comments as for EI Bullets 5/6 of Alternative 1

EI Bullet 3 - Addressed above in discussion of the Fox model

EI Bullet 4 - Addressed in the discussion of baseflow reduction above. At the scale of features being presented here, it is crucial that the formula presented in the earlier discussion, which includes baseflow routed from upstream, be used.

EI Bullet 5 - Same comments as for EI Bullet 2 of Alternative 1.

EI Bullet 6 - As pointed out above, this change in the indirect diversion is at most 1.7 mgd.

LTS Bullet 2 - ALL the intercepted and induced water from the shallow aquifer wells will be discharged to the Fox River. Water intercepted from Pebble Brook will not be returned to the brook; it will go to the Fox.

PH Bullets 1 & 2 - Same comments as for PH Bullets 2 & 3 of Alternative 1.

4) Section 4.3.4 - Alternative 4: Lake Michigan and shallow aquifer

We repeat our concerns from Alternatives 1 and 3 about the drawdowns calculated for the shallow aquifer. Other concerns with the Environmental Impact (EI), Long-Term Sustainability (LTS) and Public Health (PH) bullets have been addressed before, but bear specification below:

EI bullet 3 - Same comments as for EI Bullet 6 of Alternative 3.

EI Bullet 4 - Same comments of for EI Bullet 4 of Alternative 3.

EI Bullet 5 - Same comments as for EI Bullets 5 & 6 of Alternative 1. In addition, this item has also been discussed in section I.C above.

LTS Bullet 1 - Same comments as for LTS Bullet 2 of Alternative 3.

PH Bullets 1 & 2 - Same comments as for PH Bullets 2 & 3 of Alternative 1.

5) Section 4.3.5 - Alternative 5: Deep unconfined aquifer

More information would be useful in assessing the analysis of this alternative. The proposal is to install 12 wells in the unconfined portion of the sandstone aquifer west of where the Maquoketa Shale pinches out. They would have an assumed capacity of 1.5 mgd each. Simulations run on the SE Wisconsin Regional model then show drawdowns in the upper and lower portions of the aquifer (Exhibits 11-27 and 11-28, Volume 2, respectively). Those exhibits only appear to have 7 active wells, and no information is provided as to what hydrogeologic units and/or depths they are simulated as pumping from in the model. There is also no information on what the assigned pumping rates are. If they are all simulated as pumping 1.5 mgd, one would expect the center of the drawdown cones in the exhibits to be centered near the middle of the field of new wells. They are not in either exhibit, so we are unsure what the simulated results are indicating.

Our concerns with the Environmental Impact (EI), Long-Term Sustainability (LTS) and Public Health (PH) bullets in the Summary follow:

EI Bullet 1 - While the proposed new wells will intercept some recharge to the confined portion of the deep aquifer, water levels in it under Waukesha will rise notably if this Alternative is used. There may be some reduction of water levels between the new wells and Waukesha, but that effect will be spread out over a very large area, so new drawdowns will not be as large as the rise in water levels below Waukesha. This scenario should be re-simulated to see what the changes in water levels are throughout the impacted area.

EI Bullet 2 - No information is provided about the hardness of water in the unconfined portion of the deep aquifer. It is possible that it is softer than that in the confined portion of the aquifer from which Waukesha currently pumps water. This point should be checked and a quantitative estimate of the likely change in the discharge of water softening salt to the Fox should be provided.

EI Bullet 5 - Western Waukesha County is already part of the regional Groundwater Management Area (GMW). Exhibit 11-28 (Volume 2) shows that drawdowns exceeding

150 feet will not extend into Jefferson County, so there will be no change in the extent of the GMA. This point should really be removed as an EI.

6) Section 4.3.6 - Alternative 6: Multiple water supply sources

This alternative is very hard to assess, because insufficient definitive information is provided about how much water is anticipated to be obtained from each source. In the discussion in Volume 2, it appears the proposal is to draw 2.0 mgd from 4 remaining deep, confined aquifer wells, 2.7 mgd from the shallow aquifer (3 existing and 3 new wells), 2.0 mgd from 3 wells in the unconfined deep aquifer, and 1.0 mgd from the dolomite portion of the shallow aquifer system. These values are for the ADD of 10.1 mgd at full buildout, so presumably the plan is to draw 2.4 mgd from the outflow of several quarries. This water is already discharged into tributaries of the Fox.

There are some inconsistencies in the Volume 2 narrative, however. Exhibit 4-15 of the Summary shows 4 new wells in the shallow aquifer near the Fox, and Exhibit 11-36 of Volume 2 shows 5. Both differ from the proposed 3., and we repeat our concern about the calculated drawdowns in the shallow aquifer that we expressed for Alternatives 1, 3 and 4.

For the unconfined deep aquifer, 3 wells are proposed, but only 2 are shown on Exhibits 11-34 and 11-35 of Volume 2. In addition, the cones of depression caused by those 2 wells are centered on the northern well (Exhibits 11-34 and 11-35 of Volume 2). If they are pumping at equal rates, we would expect the cone to show an influence from both wells, not just one. More information is needed to assess the validity of those exhibits.

We would like to see other possible combinations examined, and question the need to expand the sources to include the quarries and possibly even the dolomite. A combination of deep confined, deep unconfined and RBI wells along the Fox would be the most interesting other combination to consider.

Our concerns with the Environmental Impact (EI), Long-Term Sustainability (LTS) and Public Health (PH) bullets in the Summary follow:

EI Bullet 2 - Here the reference to water levels is unclear - "water levels are currently down 400 to 600 feet...". Is the reference to ground surface (inappropriate) or to the pre-development water levels (appropriate). Clarification is needed because of the inconsistent usage earlier in the report.

EI Bullet 6 - This should be removed, as it is incorrect. The drawdown cited in the current text refers to that which would develop if 10 mgd were pumped from the unconfined deep aquifer. Exhibit 11-34 (Volume 2) shows that the maximum drawdown when 2.0 mgd is being pumped (this alternative) is only on the order of 40 feet.

PH Bullet 1 - Once again it would be more informative to show the potential sources of contamination that would be near the proposed wells.

PH Bullet 4 - Fractures in the dolomite do enhance the possible migration of contaminants as stated. They also increase the productivity of this hydrogeologic material, which could enhance the viability of wells in the dolomite.

IV. Conclusions

For the sake of brevity, this section of our analysis refers to the Application's Alternatives by number. For quick reference, the Alternatives are:

- Alternative 1: Deep confined aquifer and shallow aquifer
- Alternative 2: Lake Michigan with return flow
- Alternative 3: Shallow aquifer and Fox River alluvium
- Alternative 4: Lake Michigan and shallow aquifer
- Alternative 5: Deep unconfined aquifer
- Alternative 6: Multiple water supply sources

Waukesha's Application provides copious analysis and supporting information, but the effort is sometimes misdirected or misleading as it applies to the need for a new water source and the alternatives that are available.. In our opinion it has some considerable shortcomings that have been raised above. We encourage the Wisconsin Department of Natural Resources to work with Waukesha to strengthen the Application by further addressing the following:

- A main premise of the Application is that Waukesha's groundwater supplies are unsustainable. However, water levels in the deep aquifer are no longer declining, and only cursory attention has been provided to the conjunctive use of the shallow aquifer and the Fox River via RBI. The latter appears to be able to greatly increase the locally available amount of water that the shallow aquifer system can sustain in Alternatives 1, 3, 4 and 6.
- In a point related to the first bullet, it would be useful if Exhibit 4-2 of Volume 2 were updated to include 2012 (and ultimately 2013) pumping data. This would allow more direct comparison of recent changes in pumping and water levels in the deep aquifer.
- An apparent miscalculation of drawdowns caused by proposed wells in the shallow aquifer occurs in Alternatives 1, 3 and 4 and possibly 6 due to the false assumption that shallow wells pumping from unfavorable locations remain confined. This leads to unreliable modeling results and an overstatement of the impacts of the proposed pumping on surface waters. It would be very useful if three reports which provide details on this issue were appended to the Application. The reports are listed in the references of Volume 2 as: RJN

Environmental Services, LLC. 04/2010, RJN Environmental Services, LLC. 02/2011, and RJN Environmental Services, LLC. 08/2013.

- The Application's location of most of the proposed shallow aquifer wells along Pebble Brook and other tributaries to the Fox River through the Vernon Marsh is hydrologically unfortunate. It maximizes impacts on those small water bodies while transferring intercepted groundwater to the Fox. The result is identification of Alternatives 1, 3 and 4 as having unacceptable impacts, which could be alleviated by relocating the wells to areas along the Fox.
- A recurring, but erroneous, concept underlies Waukesha's presentation in many of the Alternatives - that "every gallon of water withdrawn from the shallow aquifer comes at the expense of surface water flows (lakes, streams, wetlands)" (Section 2 of Volume 1). It fails to recognize the water withdrawn from the proposed shallow aquifer wells will be returned to the Fox River, and that locating those wells along the Fox River would virtually eliminate impacts to surface water baseflows in Alternatives 1, 3, 4 and 6.
- There is a parallel, but understated, impact to baseflow in the Fox River associated with Alternative 2. The roughly 5.5 mgd of water presently being transferred from the deep aquifer to the Fox would no longer be discharged to the river, thus decreasing its baseflow.
- Frequent arguments about chloride reductions due to reduced hardness in Lake Michigan water and about the possible occurrence of arsenic in the shallow aquifer need to be quantified with supporting evidence.
- The maps provided in the Application documents for Alternative 5 could be interpreted as showing some problems with the drawdowns calculated in the unconfined deep aquifer. This is based on our assumption that the wells shown on the drawdown maps are all pumping from the same formations and at the same rate. The Application should clarify what geologic units each well is pumping from and at what rates. If our assumption is correct, then the failure of the drawdown to be centered around the active wells should be addressed.
- Alternative 6 ought to include other combinations. At the very least a combination of some deep aquifer wells, existing shallow aquifer wells 11, 12 and 13 (along the Fox), and additional RBI wells close to the Fox and downstream from the WWTP. This combination should not include shallow aquifer wells located away from the Fox River.

V. References

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OUR WATERS

The waters of Southeastern Wisconsin are vast but vulnerable. We depend on our waters for drinking water, irrigation, industry, transportation, power production, recreation and scenic beauty. Understanding our region's water-related issues and future challenges can help us protect clean, abundant water for generations to come.

Sustainable Water Supply: Testing a Concept in Southeast Wisconsin

Groundwater: An Abundant Yet Fragile Resource

Scientists cannot be entirely sure how much groundwater exists, since it is hidden underground. Nonetheless, they estimate that a whopping ninety-six percent of all the liquid fresh water on earth (water not bound up in glaciers) is underground. So groundwater is amazingly abundant. Yet in many places, groundwater supplies are being stretched thin and a precious resource is being depleted.

Close to half of the world's population relies on groundwater as their primary source of drinking water (Giordano, 2009, p. 7.5). Groundwater is popular as a source of drinking water because, historically, it was usually pure and tasty. Some of the groundwater that is used for drinking supplies has been deep underground for thousands of years. It is, literally, fossil water. Even water that was more recently above ground, falling as rain and then soaking into shallow aquifers, is often cleaner than surface water. Just as a sand filter for a swimming pool purifies the water as it moves slowly through fine particles of sand and clay, groundwater has been cleaned and purified by the soil as it moves slowly downward into the aquifer.

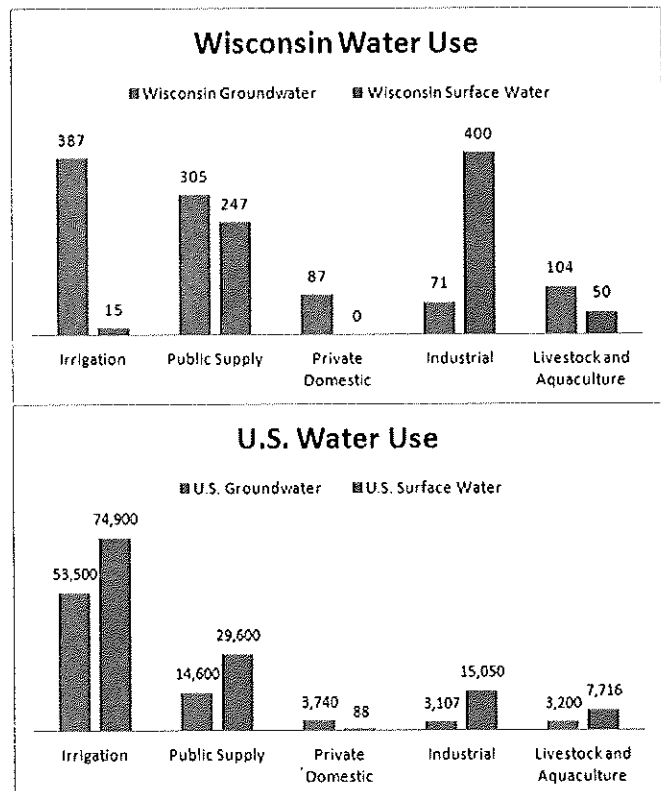
"Spring water" is so popular today that it lines shelf after shelf at the nearest convenience store. Trucks carry large jugs of it to homes and offices. And communities that rely on groundwater often find that the water is so pure that it does not require any treatment before being distributed to homes. Chlorine is added only to protect the water from bacteria that it may pick up in the distribution pipes and household pipes before reaching our water glasses.

In the U.S., two-thirds of all groundwater pumped from aquifers is used to irrigate crops. Nearly 20 percent of groundwater withdrawn from aquifers is used for public water supplies (Figure 1).

In Wisconsin, the share of groundwater used for public water supply is higher than the national average. Two-thirds of

Fig. 1. Water withdrawals from surface water versus groundwater in Wisconsin and the US, by type of use.

In millions of gallons per day (MGD). Both graphs exclude mining and thermoelectric power.



Source: Estimated Use of Water in the United States in 2005, USGS, Circular 1334.

Wisconsin residents use groundwater as a drinking supply. Almost a third of all the groundwater pumped in Wisconsin is used for public water supply, and about half of the groundwater withdrawn is used in agriculture, mostly for irrigation, but also for watering livestock and in aquaculture (see Figure 1; U.S. Geological Survey, Water Science for Schools, 2011, data from 2005). Consequently, in Wisconsin, the groundwater is an especially important resource and represents a substantial piece of the challenge of achieving sustainable water use.

The Sustainability Problem: Pump and Dump

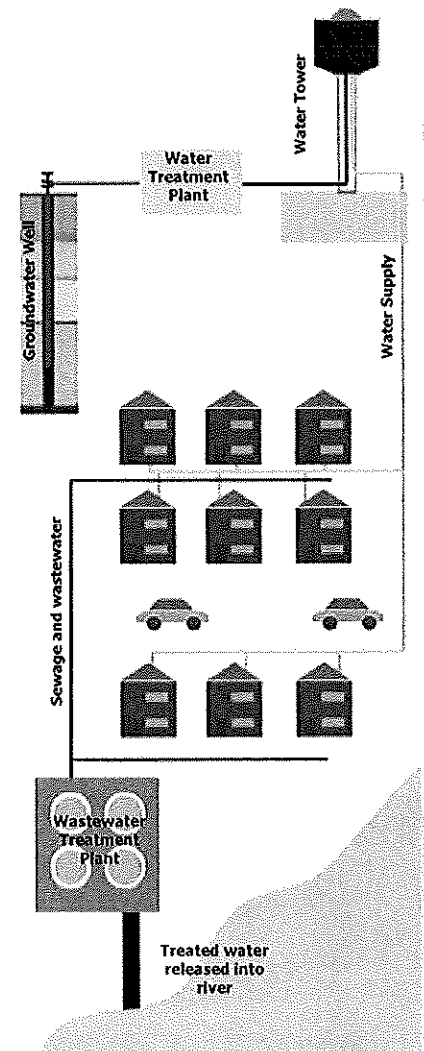
With few exceptions, the way in which communities use groundwater for their water supply—whether for household use or industrial use—is inherently unsustainable. Groundwater is pumped from underground aquifers, used once at the surface, and then discharged to a nearby stream or lake. This practice has been dubbed “pump and dump” (see Figure 2) by the scientists and other professionals who study groundwater.

Even if the discharged water were cleaned to pristine condition (which it is not), the practice of “pump and dump” moves water from our underground aquifers to surface waters, forever changing the balance of water that is at the surface compared to the amount underground (see Figure 3). And while today we have the technology needed to return the water to the same pure condition that it was in when it was underground, current wastewater treatment standards are based on removing only enough of the pollutants to allow the surface water to remain in moderately acceptable condition. Treatment is not based on the quality of the water where we found it—deep underground.

The practice of “pump and dump” can cause a number of problems. In some places, discharging groundwater into surface waters can increase water levels in the receiving lake or stream. In other places, pumping of groundwater causes rivers and streams to run dry as the water table drops in response to pumping more water than can be replaced by rainfall. Instead of being returned to the aquifer, the water is dumped in other locations that are not connected to the aquifer from which the water was taken. Or, in the case of agricultural irrigation, much of the water is lost to evaporation and evapotranspiration (evaporation through the respiration of plants).

In many places that depend on groundwater, the available supply of groundwater dwindles as the amount of water pumped from underground far exceeds the amount of new rainfall that makes its way to the aquifer. As a result, the water level in the aquifer falls, and pumping costs become ever greater. New wells must be drilled to deeper levels in order to produce enough water to meet the community's needs. In addition, as the water level drops in the aquifer and as the wells get deeper, the water quality often begins to suffer. As the water is removed, rock layers are exposed to air, and chemical reactions may occur that result in off tastes and odors, even releasing harmful chemicals. In addition, deeper layers in aquifers may contain more dissolved minerals and salts, resulting in taste, odor, and health concerns.

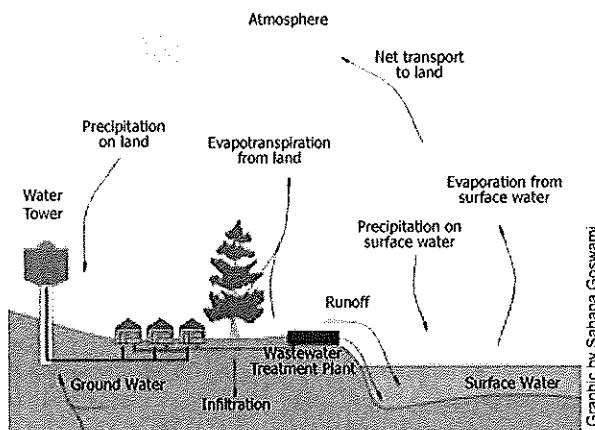
Pump and Dump Cycle



Graphic by Sahana Goswami

Figure 2. The Pump-and-Dump Cycle

Many urban and suburban communities depend heavily on groundwater for their daily water requirements. Where groundwater is used for public water supply, wastewater is generally channelled into the nearest surface water source, and an imbalance is created between surface and ground water levels in the region.



Graphic by Sahana Goswami

Figure 3. The Water Cycle

A More Sustainable Approach to Water Supply

Definitions

River Bank Inducement (RBI) is the placement of wells within permeable sediments adjacent to surface waters. As the wells are pumped, water is induced to travel underground through sediments toward the well. See Figure 7.

River Bank Filtration (RBF) is the use of RBI for the purpose of filtering the surface water for human use. RBF can be a more cost-effective method of treating potable water for some kinds of pollutants.

Aquifers are wet underground layers of water-bearing permeable rock or unconsolidated sediments (gravel, sand, or silt) from which groundwater can be usefully extracted from a water well.

Baseflow is the groundwater seepage into a stream channel. During most of the year, stream flow is composed of both groundwater discharge and land surface runoff (Figure 5). When groundwater provides the entire flow of a stream, baseflow conditions are said to exist.

Fossil water is groundwater that has remained sealed in an aquifer for a long period of time. Water can be stored underground in "fossil aquifers" for thousands or even millions of years. When changes in the surrounding geology seal the aquifer off from further replenishing from precipitation, the water becomes trapped within, and is known as fossil water.

Leach bed, sometimes called a drain field, is composed of porous sediments that allows wastewater—usually from private septic tanks—to percolate slowly down to the water table, filtering the water as it moves through the leach bed.

Water table refers to the uppermost layer of groundwater, or the surface of the water saturated part of the ground.

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The freedictionary.com, www.thefreedictionary.com

Wisconsin DNR, <http://dnr.wi.gov/wmr/mag/html/supps/1999/aug99/under.htm>

Iowa DNR, <http://www.igsb.uiowa.edu/Browse/baseflow/baseflow.htm>

Wondmagegn Yigzaw and Faisal Hossain, Fossil Water And Depleted Natural Lakes As Climate Forcings – A Review, Climate Science: Roger Pielke Sr. [2011]

The way that we use groundwater is clearly unsustainable. Continuously pumping a pristine resource, using it once, and then dumping it in surface water just cannot be a wise use of a resource. Anyone could design, in concept, a more sustainable approach, more like a closed-loop system. After the groundwater was used, a wastewater treatment plant would clean the water so that it could be piped directly to the drinking water treatment plant, where the water would be further purified before being sent out to homes, schools, and businesses to supply tap water. The same water would be recycled over and over. New groundwater withdrawals would be needed only to accommodate population growth and losses due to leaky pipes and evaporation.

So why do we use our groundwater as a "throwaway" item rather than using it in a sustainable way?

One reason is what water supply managers call "the yuck factor". In virtually every community in the U.S. where a fully recycled water system is proposed, people have objected to the idea of drinking purified wastewater; it seems just too "yuck-y" to contemplate.

A second reason is cost. We have become accustomed to paying only enough for wastewater treatment to protect our rivers and streams from the worst symptoms of pollution. More effort would be needed to treat used water to a condition we would find acceptable in our water glass.

As a result, we find ourselves with a drinking water supply system that allows some people—those who live near a high quality aquifer—to drink clean, sometimes ancient water that has barely been touched by modern contaminants. Their wastewater is discharged to streams and lakes, carrying a burden of pollutants that we, as a society, have decided are just too troublesome to clean out of the water.

The people who get their water supplies from surface water drink a mixture of direct rainwater, rainfall runoff from farm fields and urban streets, lawns, and parking lots; groundwater that flows up into streams and lakes; and wastewater treatment discharges.* Water is pumped from the surface body of water, treated, consumed, excreted, treated, and discharged to the same body of water where it came from. Pollutant problems aside, this is fairly sustainable.

So the problem is this. If communities can use surface water, treat it, and return it to the same body of water to be reused again another day, without a "yuck" response and without bankrupting costs, why are cities in other places practicing "pump and dump"? It seems that we have allowed ourselves to be complacent about squandering groundwater, cleaning it up just enough to keep streams and lakes from turning into green gunk and from making us sick if we dare go in it. Meanwhile, the damage we are causing underground—the depletion of the groundwater—is out of sight and typically out of mind. Until water shortages strike or the groundwater begins to go bad.

*Groundwater that is directly connected to surface water may contain a similar mixture, except that the water's movement through the soil helps to filter out contaminants before the water is drawn into a well. In contrast, communities that draw on confined aquifers, where fossil water has been protected from human contamination, are drinking water that is often as pure as is possible today.

A Middle-Range Alternative: River Bank Inducement

A middle-range alternative is a step that we can take on the way to becoming a fully sustainable system. A middle-range alternative is not completely sustainable, but it is acceptable in terms of performance, technology, and cost. River bank inducement (RBI) is a middle-range alternative.

River bank inducement is a strategy for achieving something like water recycling, but at lower cost than direct recycling and without the "yuck" factor. River bank inducement has been used successfully in the U.S. and in other countries around the world. The progression from natural groundwater discharge (baseflow) to RBI is shown in Figures 5, 6, and 7.

Public water supply wells are purposely located within a productive zone near a river. As the well is pumped, the well intake pipe draws water through the pores of sediment and rock, filtering out impurities. Just as the leach bed for a septic system purifies the water as it moves slowly through fine particles of sediment, in river bank inducement, the sediment between the riverbed and the well filters water as it is drawn toward the well. As the water moves underground from the river to the well nearby, levels of nitrates, sulfates, manganese, and many organic contaminants are reduced. At the same time, biological contaminants—like bacteria—also break down or attach to the soil particles, where they eventually die because the environment is not hospitable for them.

In the U.S., at least half a dozen cities have switched from using surface water (usually river water), which was becoming increasingly degraded, to using River Bank Filtration, an application of RBI to specifically reduce water treatment costs for water supplies. For example, Dayton and Cincinnati, Ohio; Des Moines and Cedar Rapids, Iowa; Lincoln, Nebraska; and Louisville, Kentucky use River Bank Filtration to filter river water before drawing it into the drinking water treatment plant (see sidebar for details). In these cases, the process of drawing the water through the subsurface soils has reduced bacteria, nitrates, and pesticide contamination found in the surface water. In these examples, river bank inducement is used as a way to improve source water quality by filtering the water through river bank sediments on its way to the well.

In Cedar Rapids, for example, 74 percent of the well recharge is water from the Cedar River. Cities in Europe have been using river bank inducement for even longer. Dusseldorf, Germany has used river bank inducement for over 150 years.

In addition to filtering river water more economically than other filtering alternatives, river bank inducement can also be used to achieve sustainable use in terms of the quantity of water withdrawn from groundwater.

River bank inducement already occurs to some degree in many wellfields in Wisconsin, too. Hydrogeologists site shallow wells adjacent to surface waters in order to intercept groundwater flow that would otherwise flow into streams and lakes. In some cases, the well pumps so strongly that it ends up drawing some water from the direction of the surface water body, moving water from the riverbed toward the well. This is precisely what river bank inducement does by design rather than by accident.

Examples of RBI/RBF in the U.S.

Cedar Rapids, Iowa supplies drinking water to its residents from a series of shallow wells constructed along the Cedar River. The facility has an estimated capacity of 65 MGD and comprises four wellfields with 45 vertical wells and four horizontal collector wells.

Des Moines, Iowa lies in the Raccoon River watershed. In 1998, Horizontal Directional Drilling technology was used to install a high-capacity ground water production well. The shallow groundwater receives natural filtration prior to entry into the wells.

Lincoln, Nebraska obtains 30 percent its source water from two RBF horizontal collector wells and approximately 40 vertical groundwater wells. The two horizontal collection wells are located 70 feet below the surface of the river, and are considered as Ground Water Under the Direct Influence (GWUDI) of surface water.

Kansas City, Missouri installed a riverbank filtration system in 1997. This system is located along the Missouri River. The facility comprises 2 collector wells, each designed to produce 25 MGD continuously with a peaking capacity of 40 MGD.

Louisville, Kentucky contracted with the Louisville Water Co. for the supply of drinking water to city residents. The company introduced riverbank filtration on the Ohio River to ensure a sustainable and continued source of safe water for the city. A 20 MGD horizontal collector well system was constructed in Louisville in 1999 for a cost \$5 million.

A Solution for Southeast Wisconsin?

RBI/RBF Outside the U.S.

Dusseldorf, Germany has been using RBF since 1870 to provide its public drinking water supply. The facility's average production is 44 MGD, supplying 600,000 residents with treated bank filtrate.

Approximate 16 percent of all drinking water in Germany is RBF filtrate. RBF wells are located along the Rhine, Elbe, and Danube.

Goerlitz, Germany is located along the Neisse River, which marks the border between Poland and Germany. RBF has been in operation since 1878. The site consists of two well galleries, which include infiltration ponds, artificial infiltration basins, and 32 vertical wells.

Budapest, Hungary obtains 90 percent of its daily supply from RBF wells. These wells supply approximately 154 MGD to the water supply in Budapest. The RBF is used as a way to protect public water supplies from risks of contamination found in surface water supplies.

The Netherlands obtains 7 percent of its drinking water supply from RBF. The first well using this approach was developed in 1879. By 1950, fifteen wells pumped in this way. Today, twenty-six well-fields along the Rhine and Meuse Rivers are in operation, providing a portion of the public water supply across the Netherlands.

Southeast Wisconsin is experiencing some of the problems typical of a "pump and dump" system. Although much of the eastern portion of the region uses water from Lake Michigan, returns the water to the lake and reuses it, many communities throughout southeast Wisconsin rely on groundwater, use it once, and dump it into the nearest surface water body. The practice has caused an alarming rate of groundwater depletion in southeast Wisconsin, and groundwater is declining in quality as well, requiring some groundwater-dependent communities to treat the water before it can be distributed to homes and businesses.

For the past several years, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) has been conducting a study to identify alternatives for meeting the region's water supply needs through the year 2035. The study explored a number of alternatives, primarily:

- shifting to greater use of shallow aquifers or
- shifting to greater use of Lake Michigan water.

The study explored the feasibility of recycling water by infiltrating treated effluent, but did not include this option in its final plan. It did not explore the feasibility of RBI.

The studies conducted by SEWRPC found that greater use of the shallow aquifer could help to meet the region's water needs, but that undesirable—even unacceptable—impacts to surface water bodies would likely begin to appear and would intensify after 2035. The study also recommended shifting to greater use of Lake Michigan water, both within the Lake Michigan basin and in the city of Waukesha, where an application for a diversion of Lake Michigan water is being evaluated.

Recently, a team of scientists and engineers from UWM, USGS, and Black and Veatch explored whether river bank inducement could meet the water needs of groundwater-dependent communities in southeast Wisconsin. The scientists made careful observations, field analyses, and simulations of a shallow aquifer along the Fox River in southeast Wisconsin. The purpose was to understand how the water moves underground in response to pumping from wells located near the stream.

The research reached the following conclusions.

- Some City of Waukesha wells in the vicinity of the study site are already operating like a water recycling system. A portion of the water in two wells comes underground from the Fox River, and the Fox River water is a mixture of groundwater, rainfall, urban and agricultural runoff, and wastewater discharged by communities upstream.
- River bank inducement (RBI) could realistically supply water. In communities along the Fox River, for example, an appreciable amount of the water currently being drawn from wells in the shallow aquifer could be replaced with wells purposely located to recycle river water via the groundwater connection. The quantity of water that might be withdrawn would depend on well placement and local conditions, but RBI wells could produce an appreciable part of the area's long-term water supply needs.

Natural Flow to Streams, Interception, and Induced Flow from Streams

Natural Condition

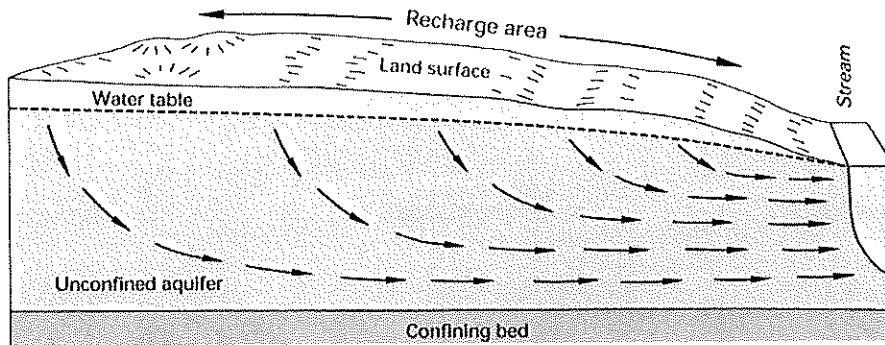


Figure 5. Natural Condition.

The "natural condition" refers to the general direction of flow of sub-surface water near a surface water body such as a river. In the diagram (left), the water flows through the unconfined aquifer and discharges in the stream.

Interception

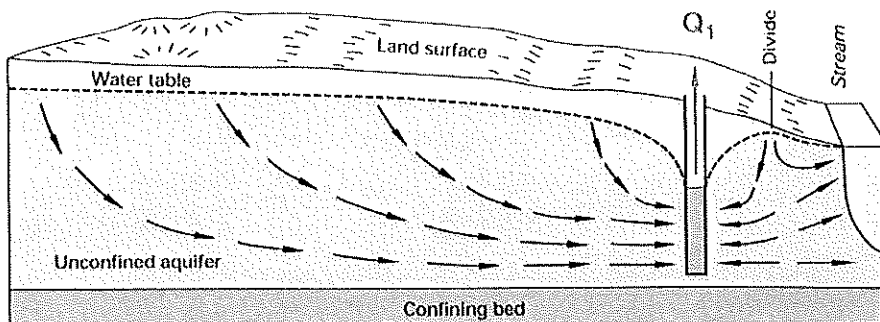


Figure 6. Intercepted Baseflow.

The prevention of water from following its natural flow patterns by the introduction of element(s) which impede the flow. In this case the impediment is the introduction of a well which removes the groundwater before it can reach the stream, thus reducing baseflow flow into the stream. If water from this well is returned to this same stream as treated wastewater, the net effect on streamflow will be negligible.

Inducement,
also known as River Bank Filtration

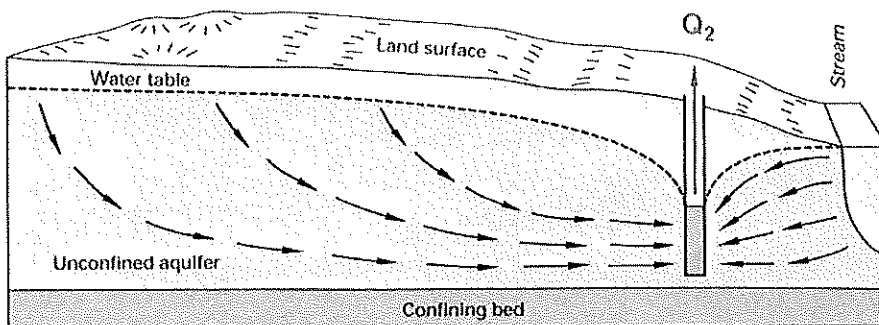


Figure 7. Induced Streamflow.

Change in the flow of the stream caused by the introduction of an element such as a well which causes reversal in direction of flow. The water moves out of the stream instead of into it. Reduction in baseflow will occur, unless the well water is later discharged as wastewater at an upstream location.

Images courtesy:



Local Study of River Bank Inducement Shows Promise

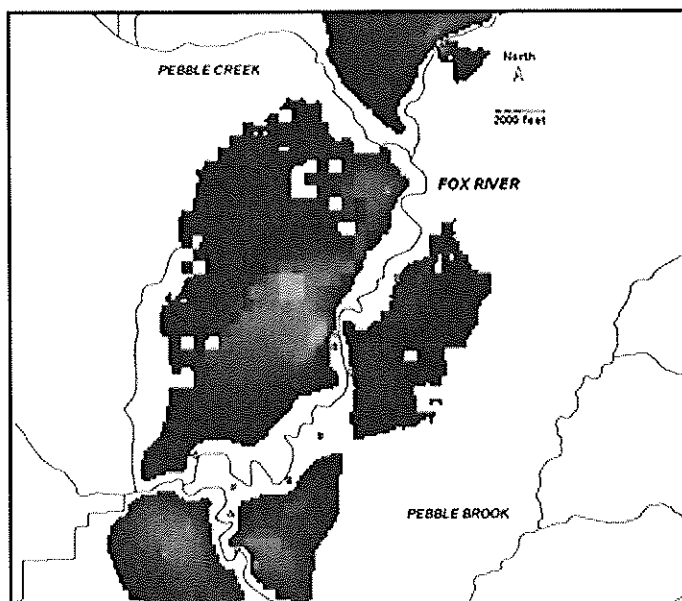
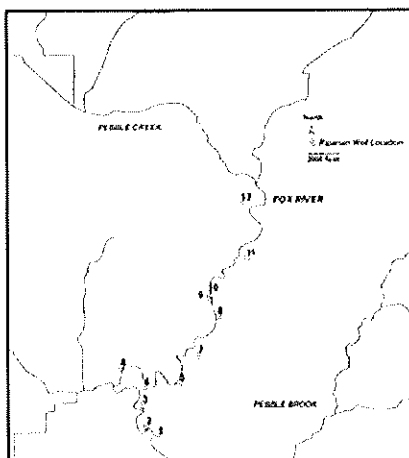
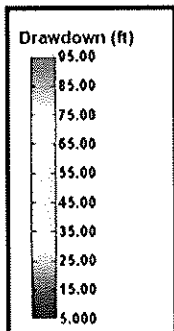
**Figure 8a.
Hypothetical Well Locations**

Locations of 12 hypothetical riparian wells, each pumping about half a million gallons per day from glacial aquifer.

Legend for Figures 8b and 8c.

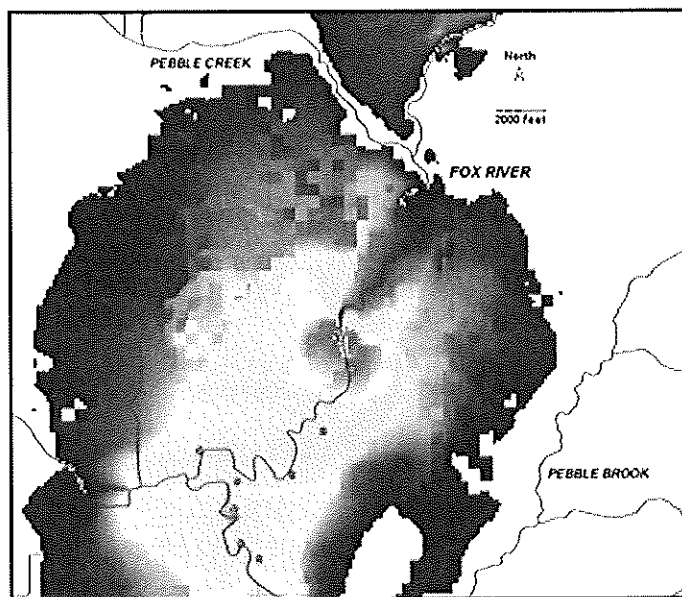
Yellow to red color indicates more severe drawdown of the aquifer.

Green to blue color means less severe drawdown of the aquifer.



**Figure 8b.
Simulation
Results with
RBI**

Model simulated drop in water table elevation with RBI active (about 40% of pumping induced from river).



**Figure 8c.
Simulation
Results with
Limited RBI**

Model simulated drop in water table elevation with little or no RBI (virtually no pumping induced from river).

- After use, wastewater could be returned to the Fox River upstream from the river bank wells. The wells would then draw in some of that recycled water, along with some groundwater that had not been used previously. In one hypothetical scenario, the study estimated that 50 percent of the well water in a system of RBI wells would be recycled. And communities adopting this approach would not be exporting their "mess" to downstream communities. Communities would be recycling some of their own used water via river bank inducement.

- The flows in the Fox River (low-flow, baseflow or otherwise) would be unchanged because the used water is returned to the channel upstream. As a result, river bank inducement would minimize groundwater drawdown and impacts to small streams and springs compared to a supply system that located wells away from the river (see figures, left). An alternative approach would be to place RBI wells near smaller streams or wetlands and return the treated effluent to the Fox. In this case, water levels and flow in the small bodies would decrease, while baseflows in the Fox would increase locally.

- Some kinds of pollutants—those not removed by current wastewater treatment processes and those that move easily through sediment—would increase over time in the recycled water and would require treatment. In particular, chloride (typically from road salt and water softener discharges) is already high in the Fox River, and RBI would concentrate the salt, possibly requiring treatment

Application in Southeast Wisconsin and Beyond

before the water could be sent to consumers. Most organic pollutants (like those from personal care products) and heavy metals would build up only very slowly over time. In order to prevent public health issues from potential contaminants in municipal wastewater, treatment systems may be needed eventually, such as reverse osmosis or ozone treatment. Communities would have an opportunity to monitor pollutants and adjust the wastewater and drinking water treatment processes over several decades as needed.

- The costs of producing water from RBI wells are very similar to the costs associated with other ground water sources in southeast Wisconsin, but with much greater sustainability over a longer period of time. The cost comparisons done do not factor in chloride removal

Conclusion

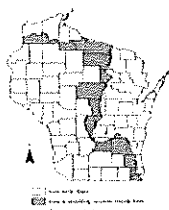
The results of this study on the Fox River could be extended to other communities, both in southeast Wisconsin and other parts of the state where groundwater is being stressed by “pump and dump” practices. According to the scientists, River Bank Inducement offers a potential solution along larger rivers as long as the river is in contact with a relatively permeable aquifer so that water can move from the river underground to wells located nearby. Wastewater, after the water is used by homes and businesses, would be discharged after normal sewage treatment to the same river or a tributary, upstream of where the wells are located. This approach could achieve a more sustainable water supply at a fraction of the cost required by a simple closed-loop recycling system and protect our groundwater aquifers from becoming depleted.

Other topics in the “Our Waters” series

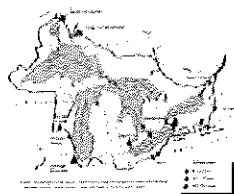
“Our Waters” is an educational series about regional water issues, published by GLWI and UWM with support from the Brico Fund.

Learn more about Our Waters at:

<http://home.freshwater.uwm.edu/ourwaters/>



The Great Lakes Compact is an unprecedented, multi-state agreement for managing the waters of the Great Lakes. The Compact recognizes the lakes as a shared resource which no single state owns, but of which all Great Lake states are stewards. A defining feature of the Compact is its emphasis on regional cooperation to manage the lakes as a single ecosystem.



A diversion is any transfer of water across watershed boundaries through a man-made pipeline or canal. Diversions of Great Lakes water provide public supplies and support irrigation, industry, shipping and recreational boating. While the impacts of diversions on lake levels are minor, they alter the natural flow of the Great Lakes.

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The Brico Fund also provided support to Nancy Frank and Sahana Goswami for the preparation of this summary of the research.



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June 17, 2011

To: Eric Ebersberger, Larry Lynch and Constantine Tsoris
Wisconsin Department of Natural Resources
From: Doug Cherkauer, Emeritus Professor of Geosciences
University of Wisconsin-Milwaukee
Re: Additional commentary on aspects of groundwater modeling
of the shallow aquifer system around Waukesha wells 11, 12, 13.

As a follow up to the April 1 meeting at the WDNR, at which we discussed the construction and application of a groundwater flow model developed by the USGS for the Upper Fox River Basin, we sent you a memo on April 23 summarizing the “takeaway” points from the meeting. That memo also raised two issues involving the development and application of the Troy Bedrock Valley groundwater flow model, used by the Waukesha Water Utility to analyze various pumping scenarios. These issues involve the possible biases in modeling results arising from a) the use of confined conditions around pumping wells, tending to underestimate drawdown at existing and hypothetical wells and b) the use of community-scale indicators to quantify changes in base flow, which tends to overestimate the effect of pumping on streams because it is not at the proper scale for evaluating the amount of water induced from streams by wells. We hope you have had a chance to review that memo.

In May the city of Waukesha released documents responding to questions raised by the WDNR regarding their application for a diversion from Lake Michigan. One document deals directly with our presentation of the Upper Fox model – it consists of a memo written by John Jansen, formerly in the employ of Ruckert & Mielke, now a consultant at Cardno ENTRIX. John’s memo is well reasoned and cogent; he makes several valid arguments about the uncertainty of the model, especially with respect to its application to the current Waukesha pumping center incorporating shallow public supply wells 11, 12 and 13. However, there are several points we would like to make in response which we feel are important in understanding the potential for enhancing Waukesha’s water supply by means of a riverbank inducement (RBI) system of wells along the Fox River.

With respect to particular claims in John’s letter about the hydrostratigraphy local to Waukesha’s existing shallow well field:

a. It correctly points out that there are few logs within the river corridor. It then appends 6 logs as being representative of the area near the well field. All of them, except

log AY344, show appreciable thicknesses of fine-grained material. However, two of the logs (those on Hazlehurst) are located outside the river corridor. The corridor itself is where we anticipate discontinuities in fine-grained sediments are most likely to occur. Consequently, John's analysis is actually showing that 1 of 4 (25%) of the wells in the corridor near the well field have thin to non-existent clay.

b. The letter glosses over the fact that if windows, or discontinuities, in the clay were to exist, they would appear in only a small portion of drilled wells - as is the case in the data set he has provided. In this sense, the data set supports our conceptual model for the deposition of the sediments in the river corridor.

c. The letter also fails to point out that there are several test borings (TBs) from the Lathers site to the south of the 11-12-13 site that encounter predominantly sand. TB 12 contains all coarse material, while TBs 1 and 2 only encounter fines at the ground surface. In addition, TBs 7 and 9 both contain over 85% coarse-grained deposits. These are out of a total of 12 drilled at the site.

More important than the details of the representation of the geology around wells 11, 12, and 13 are two general points that guided our analysis and we think have broad implications for understanding the potential for implementing a RBI system:

- 1) Preferential flow is a crucial control on groundwater flow in heterogeneous settings, and in particular for the glacial and alluvial material characteristic of the Upper Fox River Valley where fine-grained and coarse-grained deposits tend to be intermixed and show very limited lateral or vertical continuity. Repeated experiences modeling these sediments show that even if an area is dominated by fine-grained sediments, the presence of even a small volume of sand and gravel can increase the effective transmissivity of the aquifer considerably. In many cases a few preferential flow horizons of variable orientation within silt and clay sequences control the ability of the aquifer to transmit water to streams and wells. In the USGS model constructed for the Upper Fox, special attention has been paid to accounting for preferential flow at the proper scale through an interpolation algorithm applied to available logs. In the "fine-favored" version of the model, the algorithm was applied in a way to maximize the connectivity between fine-grained material and minimize the connectivity between coarse-grained material. Yet the application of this "fine-favored" model version to a hypothetical riparian well field along the Fox still showed that about half the roughly 7-8 mgd sustained from the hypothetical wells was induced from the Fox, and that much of the flow occurred through preferential flow zones. It further showed that this induced flow would reduce drawdown considerably relative to a system isolated from the river, while at the same time allowing for recirculation to the Waukesha waste water treatment plan, thereby sustaining base flow. For more information on these lines of argument, please see the notes to the original April 1 presentation.

- 2) It is of course difficult to capture the local effects of preferential flow with a model given the fine scales involved. For that reason any model simulation influenced by preferential flow should, if possible, be supported by other lines of evidence. The reason we highlighted the response of the groundwater flow system around Waukesha wells 11, 12 and 13 was not to raise any concern about the viability of those wells (in fact they appear to be excellent long-term producers with good water quality), but because other lines of evidence were available at this site against which we could more rigorously test the model input and results. John's letter did not discuss these data, but they include:
 - a) observed vertical gradients between the Fox River and shallow piezometers, notably downward gradients in the area of the apparent preferential flow zone associated with log AY344 and located about 1000 ft south of Waukesha well 11, suggesting that the drawdown around the well field is influenced by preferential flow zones;
 - b) field and geophysical surveys in the area, which show the riverbed to be heterogeneous and suggest relatively coarse sediments to the south of wells 11 and 12; and
 - c) perhaps most important, observed chloride trends, which suggest that in recent years part of the discharge to wells 11 and 12 (on the order of one third) is induced from the Fox river. The volume of induced water implied by mixing calculations based on the chloride concentrations compares favorably with the fluxes simulated by the Upper Fox model. The lag time between the rise in observed chloride concentrations and the onset of pumping at 11 and 12 (in 2006) also agrees well with the simulated travel times to wells if account is taken of the presence of preferential flow zones.

These various lines of evidence were presented along with the modeling results in the April 1 meeting as a test of the reliability of the model in capturing groundwater dynamics when applied to hypothetical scenarios. The availability of supporting data in the neighborhood of the existing shallow well field at Waukesha provided an unusual opportunity to evaluate the crucial role of the preferential flow mechanism in determining the sources of water to existing wells. Note there is no claim that the model duplicates the actual preferential flow paths along the Fox River over the area selected for the hypothetical system of 12 riparian wells - it is impossible without targeted studies to realize the necessary level of detail to confirm the model representation of riparian conditions. Rather the use of two model versions, one "fine-favored" and one "coarse-favored", was aimed at incorporating the uncertainty in our representation of the subsurface, thereby allowing for an improved general understanding of the capacity of a RBI system to augment water supply and minimize adverse effects related to drawdown and lost base flow. As noted in John's letter, the Upper Fox model simulations can contribute to this general understanding even if they cannot replace the targeted studies needed to test, design and implement an actual RBI system.

Lang, Kassandra M - DNR

From: Waterford Design Technologies <asikora@wdtweb.com>
Sent: Wednesday, November 27, 2013 8:40 AM
To: DNR Waukesha Diversion App
Subject: Attn: Kassie Lang

Categories: Red Category

Hi Kassie,

It's my understanding this is the email address for comments regarding the Waukesha water diversion. I am the Commission Chair for the Southeastern Wisconsin Fox River Commission (SEWFRC) and I also live on the Fox River and am a pretty hard core water skier.

I moved to Waterford from Milwaukee because of the Fox River and it's unique attributes for quality skiing. That led to my involvement in the Fox River Commission.

The Fox is not a deep river to begin with and most people don't realize our dependency on Waukesha's treated waste water discharge into the Fox.

During our dry periods sections of the Fox River are already tough to navigate by motorized and non-motorized boats.

It's my understanding that lessening our flows or lowering our water levels will also have a detrimental effect on fishing.

Consequently I'd like to state my opposition to Waukesha's application for Lake Michigan water if it reduces or eliminates their discharge into the Fox River.

I take this stance not only on behalf of the SEWFRC, but as a riparian owner as well.

Thank you,

Al Sikora

Commission Chair – SEWFRC

262-534-3906

Lang, Kassandra M - DNR

From: Rooney, John <John.Rooney@cityofracine.org>
Sent: Wednesday, November 27, 2013 11:34 AM
To: DNR Waukesha Diversion App
Cc: Yunker, Ken; James Rooney
Subject: Public Comment for DNR re: Waukesha Diversion Application

November 27, 2013

Ms. Kassie Lang
Wisconsin DNR
DG/5
PO Box 7921
Madison, WI 53707-7921

Ms. Lang:

On behalf of the Racine Harbor Commission (RHC), I offer the following concerns and comments:

1. RHC does not object to the proposed discharge of treated wastewater effluent to the Root River.
2. RHC is concerned that daily volume of effluent will contribute to increased total suspended solids (TSS) carried downstream in the Root River that will ultimately be deposited within the area under the purview of RHC. This area includes the Root River, from Marquette Street Bridge to the mouth of the Racine Recreational Harbor (RRH), as well as the RRH itself.
3. In 1985, approximately 350,000 cubic yards of material was dredged from RRH during the construction of Reefpoint Marina. This provided ample depth for navigation as a harbor of refuge, and the material was used to create new lands within the RRH for the construction of new marina ingress/egress, parking lots, publicly owned buildings and other public amenities. The dredging cost was approximately \$2,500,000.
4. In 2004, approximately 4,000 cubic yards of material was dredged in the area of the Root River under the purview of the RHC. The dredging cost was approximately \$400,000.
5. In December 2012, Lake Michigan water levels dropped to nearly the all-time recorded low of 1964. This has a negative effect on safe navigation as water levels decrease, and the bottom elevation of the Root River and RRH increases from silt that is carried downstream from the Root River and is deposited in the navigable channel of the Root River and RRH.
6. The RHC is desirous of having the Southeastern Wisconsin Regional Planning Commission (SEWRPC) consider a long range plan to fund continued dredging needs for areas under their purview. The RHC recognizes it has no taxing authority to those municipalities, government agencies and water/wastewater utilities that discharge runoff (directly or indirectly) or effluent to the Root River. The RHC believes those that discharge runoff or effluent should pay annually into a restricted reserve fund administered by SEWRPC for the maintenance dredging caused by siltation from contributed flow to the Root River.

I have represented the RHC as the Chairman since 1969, and have been the Chairman of the State of Wisconsin Waterways Commission since 1984. The funds to provide maintenance dredging provided by the Wisconsin Waterways Commission are limited by the State of Wisconsin. Furthermore, assessment to riparian

property owners for maintenance dredging is burdensome and not well received, particularly if the costs are related to dredging materials and silt resulting from contributed flow to the Root River from upstream municipalities, government agencies and water/wastewater utilities. Approval of discharge of treated effluent by Waukesha Water Utility to the Root River should be subject to SEWRPC review of this formal request to establish a dredging maintenance fund. If you any questions or need additional information please contact me.

Respectfully,

James F. Rooney
1500 Michigan Blvd.
Racine, WI 53402
262-637-7822
Chair, Wisconsin Waterways Commission (1984 – present)
Chair, Racine Board of Harbor Commissioners (1969 – present)
Member, SEWRPC (1984 1989)

Email submitted on behalf of James F. Rooney by:

*John C. Rooney, P.E.
City Engineer
Asst. Commissioner of Public Works
Secretary, Racine Harbor Commission
City of Racine
730 Washington Avenue
Racine, WI 53403
p 262.636.9460
f 262.636.9545*

Lang, Kassandra M - DNR

From: Don <donhammes@charter.net>
Sent: Thursday, November 28, 2013 11:35 AM
To: DNR Waukesha Diversion App
Subject: Waukesha Water Demands

I am sending you this message to request that you hold the City of Waukesha's request to use Lake Michigan water to the highest standards possible. The Great Lakes Compact for one. The setting of a bad precedent in the use of Lake Michigan water in an area not adjoining the lake is a dangerous action to take and one that everyone agrees is a bad one to take....that is why this standard was written.....to make sure that requests for water from areas all over the state do not compromise the compact. Stick to your values, our values, the majority of people in Wisconsin.

Thank you

Don Hammes

Lang, Kassandra M - DNR

From: Carol Steinhart <csteinxxxx@yahoo.com>
Sent: Wednesday, November 27, 2013 12:13 PM
To: DNR Waukesha Diversion App
Subject: Is Lake Michigan water is truly Waukesha's only option?

Categories: Red Category

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this. What would the rest of the Great Lakes states and provinces say about this proposal? I think you know!

The city has NOT done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented BEFORE submission of an application. The Compact says these water conservation measures must be implemented BEFORE any diversion takes place. Waukesha has long had a water conservation plan and at one time was a leader on this front, but the Waukesha Water Utility has failed dismally to put sufficient resources into enacting the plan to date.

Moreover, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off and even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels; and many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid harm to interconnected wetlands, springs, and lakes, many other parts of Wisconsin and around the nation have demonstrated that this can be done. Waukesha HAS NOT proven that the water needs of the area cannot be met through some combination of local water sources, especially when used in conjunction with a wholehearted conservation effort.

Lake Michigan is extremely valuable to local, state and regional economies and to local people and their quality of life. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has FULLY met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort. Otherwise Waukesha will be the first domino to tumble, and all the rest could come down with it.

Thank you,

Carol Steinhart
104 Lathrop St.
Madison, WI 53726

Lang, Kassandra M - DNR

From: Ernest Martinson <ernest053@centurytel.net>
Sent: Wednesday, November 27, 2013 11:56 AM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Categories: Red Category

Dear Mr. Eric Ebersberger:

With the City of Waukesha's revised application to divert water from Lake Michigan now in hand, the hard work of evaluating the merits of the City's request begins. I am concerned that the revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. For example, replacing all water subsidies such as from the State Revolving Fund with much higher water rates proportional to volume usage.

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law. While there has been a major drawdown of Waukesha's deep sandstone aquifer over the years, there are signs it is leveling off, even rebounding. Waukesha largely meets safe drinking water requirements for radium now, in part because it blends shallow-aquifer groundwater with deep-aquifer water to reduce the concentration to safe levels. In fact, many places around Wisconsin and the nation safely and economically treat drinking water to remove radium. In addition, radium-free shallow-aquifer groundwater abounds in the Waukesha area. While using this water for its municipal water supply must be done carefully to avoid impacts to interconnected wetlands, springs, and lakes, it is done in many other parts of Wisconsin and elsewhere around the nation. Waukesha must simply start charging for water in a way that reflects its true value.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. Will we continue to underprice water with subsidies or shift taxes from the value added activities to value given to us by nature, i.e., water and natural resources.

Thank you,

Ernest Martinson
15865 Guard St Apt 102
Apt 102
Hayward, WI 54843

Lang, Kassandra M - DNR

From: Cary Mui <jmui2@wi.rr.com>
Sent: Wednesday, November 27, 2013 2:12 PM
To: DNR Waukesha Diversion App
Subject: Ensure Lake Michigan water is truly Waukesha's only option

Categories: Red Category

Dear Mr. Eric Ebersberger:

I am concerned that City of Waukesha's revised application does not meet some of the most basic requirements of the Great Lakes Compact and am trusting the department to do the right thing for the Great Lakes on this.

First, the city has not done all it must do under the Compact and Wisconsin law to conserve water. Wisconsin's rules require that conservation measures must be implemented before submission of an application.

Waukesha has long had a water conservation plan — and at one time was a leader on this front — but the Waukesha Water Utility has failed to put sufficient resources into enacting the plan to date.

Secondly, until the Waukesha Water Utility proves that there is no other reasonable way to supply its users with adequate clean water, they have not met the requirements of the Compact and Wisconsin law.

Why can't they reuse their waste water the way other cities do? The technology is available now.

Lake Michigan is extremely valuable to our local, state and regional economies and to our families and the quality of life in our communities. There is a lot at stake for everyone in this first test of the Great Lakes Compact. As you evaluate the application, please ensure that Waukesha has fully met the requirements to divert water outside of the Great Lakes Basin, and that the diversion truly is a justified last resort.

Thank you,
Cary and Jamie Mui

Cary Mui
144 Hilly Oak Drive
Delafield, WI 53018

To whom it may concern,

I, Mike Payne (Waukesha resident and employed in Waukesha) submit this comment in support of the City of Waukesha (the "City") Application for a Lake Michigan Diversion with Return Flow (the "Application"). My home and place of employment is located in the City's water supply service area and strongly endorse the City's Application.

I strongly believe that Waukesha and the State of Wisconsin are poised for growth but measures need to be taken to continue to allow Waukesha to grow and prosper. Without a secure water supply, businesses and citizens will look elsewhere for communities to work, live and play. I am originally from Indiana and I chose to live in the city of Waukesha because I identified with the values of the city and truly believe it is one of the best places in the Midwest to plant roots, have a career and raise a family.

For the reasons set forth below and above, and based upon the City's Application and detailed scientific evidence and extensive modeling studies, I, Mike Payne agree that Lake Michigan water is the only reasonable water supply alternative for the City, because it the most protective of public health, the least likely to have adverse environmental impacts, the most reliable, and the most sustainable long-term water source.

The City's current water supply sources are unsustainable. I agree that the City's current water sources -- the deep St. Peter Sandstone aquifer and the shallow Troy Bedrock Valley aquifer -- are not sustainable, because the rate at which water is withdrawn from the deep confined aquifer exceeds the rate at which the aquifer is replenished, because increased pumping from the shallow aquifer will result in significant adverse environmental impacts to wetlands, creeks, streams, and lakes in the area. We also agree that a shallow aquifer source is not reasonable, because it will require the City to obtain permission to drill several wells outside of the City limits, will be more expensive in the long run than withdrawing Lake Michigan water, and will not provide a permanent solution to Waukesha's water needs.

The City's other alternative water supply sources are not as reasonable as a Lake Michigan source. I agree that a Lake Michigan source is the most reasonable water supply for the City and commend the City for its thorough analysis of alternative water sources, which began with fourteen potential water supply sources, eliminated ten of the fourteen (due to inadequate quantity, major environmental or regulatory issues, and other factors), and then chose six water supply alternatives for detailed evaluation (deep confined aquifer and shallow aquifer; Lake Michigan; shallow aquifer and Fox River alluvium; Lake Michigan and shallow aquifer; deep unconfined aquifer; and, multiple source waters (deep and shallow aquifers, surface waters). The City analyzed each alternative's environmental impacts, long term sustainability, public health, implementability, and cost-effectiveness and determined that none of the other water supply alternatives comply with this standard and are therefore not reasonable. Based on this technical evaluation, we agree that the Lake Michigan alternative provides a net environmental benefit for the waters and water dependent natural resources of the Mississippi River and Lake Michigan Basins, is the most reliable and environmentally sustainable in the long term and provides the most public health protection. Moreover, termination of deep aquifer pumping will help

restore both severely depleted groundwater levels and the natural groundwater flow regime towards the Great Lakes Basin while eliminating the adverse environmental impact that continued pumping of groundwater has on lakes, streams, wetlands, and springs. And, returning the water to a Lake Michigan tributary will result in no adverse impacts to the quality or quantity of water in the Great Lakes. In fact, recycling Lake Michigan water through a Great Lakes tributary will maintain lake levels, enhance aquatic habitat and fisheries, and minimize wasted water.

The City's current deep water aquifer source is unsafe. I agree that Lake Michigan is the safest public water supply source for the City and that water from the deep aquifer is not safe. Eighty-five percent of the City's current water supply is provided by the deep water aquifer, which is contaminated with high levels of naturally occurring and carcinogenic radium. This represents a significant health concern and prompted the U.S. Environmental Protection Agency (the "EPA") to order Waukesha to comply with safe drinking water standards by 2018. If Waukesha is unable to meet this deadline, and instead continues to supply radium-contaminated water, residents and businesses are unlikely to stay in (or move to) the community due to the risk of health concerns that accompany consumption of contaminated water. In order to protect the personal health of Waukesha residents and others who consume Waukesha water, as well as the economic health of the community, the City must establish a water source that is not contaminated, and Lake Michigan is the safest water supply source for the City.

The City's water conservation efforts do not negate the need for a sustainable water supply. I agree that the City's conservation efforts to date, while impressive, are not sufficient to negate the need for another water source. The quantity and quality of the City's water supplies have been limited for years; therefore, water conservation and water use efficiency long have been integral parts of City water system planning, design, and operation. In fact, the City's 2006 water conservation program resulted in lower water use and increased community awareness of the importance of conserving water. The Application and 2012 Water Conservation Plan (which updated the 2006 plan) demonstrate the City's continued commitment to aggressive, environmentally sound, and economically feasible water conservation measures. Nevertheless, these measures alone cannot provide the City with a sustainable water supply.

The City is requesting a reasonable amount of water. I agree that the City's request is reasonable, based on current and estimated data. Land within the City's water supply service area is 85 percent developed or environmentally protected; only 0.5 percent of the land outside city limits is undeveloped industrial land; and, only 0.2 percent is undeveloped commercial land. Population growth is estimated at a rate of 0.5 percent per year. Therefore, there is little opportunity for excessive amounts of new development, and the amount of water requested by the City is reasonable to meet the current and forecasted future public water supply needs of the City. Allowing the City to access Lake Michigan water will not adversely impact the economic prospects of other communities in southeastern Wisconsin and will allow the City to reasonably meet current and projected demand.

The Application will benefit the source watershed. I agree that the City's withdrawal will positively impact the Lake Michigan watershed by returning no less than 100 percent of the water volume that it withdraws from Lake Michigan; consequently, there will be no net loss of Lake Michigan water, other Lake Michigan water users will not suffer adverse effects from the City's withdrawal, and there will be no significant individual or cumulative adverse impacts to the waters and water-dependent resources of the Lake Michigan watershed. In fact, the Great Lakes basin will benefit from the City's return of high quality water to Lake Michigan via the Root River, which will provide water flows that

benefit habitat restoration, support the steelhead trout population in the Great Lakes, and restore highly valued flow to the watercourse during dry periods. Additionally, eliminating deep aquifer pumping will help restore the flow of groundwater toward Lake Michigan instead of away from it and will increase availability of shallow aquifer flows to surface water resources in both the Mississippi River and Great Lakes basins.

I commend the City on the thorough analysis of water supply alternatives and its continued efforts to protect public health and the environmental and economic viability of the region. A Lake Michigan water source will provide Waukesha with a safe and sustainable public water supply. A healthy and thriving Waukesha benefits all of southeastern Wisconsin. Therefore, I, Mike Payne support the City's Application and request that the Application be approved.

Sincerely,

A handwritten signature in black ink that reads "Mike Payne". The signature is written in a cursive, flowing style with a large, prominent "M" and "P".

Mike Payne

R&R Insurance Services, Inc. and Waukesha Resident

WAUKESHA COUNTY BUSINESS ALLIANCE

Advocate

Develop

Network

Promote

November 27, 2013

Wisconsin DNR DG/5
Attn: Kassie Lang
PO Box 7921
Madison, WI 53707-7921

Ms. Lang,

I submit this comment in support of the City of Waukesha's application for a Lake Michigan Diversion with Return Flow, as a resident of the City of Waukesha and employee in the City of Waukesha. Based upon the City's Application and detailed scientific evidence and extensive modeling studies, I believe that Lake Michigan water is the only reasonable water supply alternative for the City, because it the most protective of public health, the least likely to have adverse environmental impacts, the most reliable, and the most sustainable long-term water source.

- **Waukesha's proposal will have no impact on Great Lakes levels.** Waukesha has proposed returning no less than 100% of the volume of withdrawn water.
- **Waukesha is not a precedent for diversions that could threaten the Great Lakes.** If Waukesha is given access to water, that will *not* change the line on future diversions. The line was drawn in 2008, when the Great Lakes Compact became law. U.S. Congress ratified the agreement between the Great Lakes states and Canadian provinces that prohibits water from going beyond counties that straddle the Great Lakes basin divide.
- **Waukesha's return flow will improve the quality of the Root River.** Return flow water quality will meet all state and federal water quality limits. In some cases, return flow to the Root River will actually *improve* water quality in the river.
- **Adding to the flow of the Root River would improve the level of the Root River,** particularly during fall spawning runs of salmon and trout. Since 1966, the base flow of the Root River has been reported to be too low to support water quality, recreation, and fisheries goals in the watershed. The DNR and Southeastern Wisconsin Regional Planning Commission have previously explored adding to the volume of water in the river, but until now have been unable to augment the river's flow because the costs were too high. During the summer and fall, some sections have very low flow, which does not support functional habitat and water quality for fish.
- **There will be no risk of a sewer overflow to the Great Lakes from Waukesha.**

WAUKESHA COUNTY BUSINESS ALLIANCE

Advocate

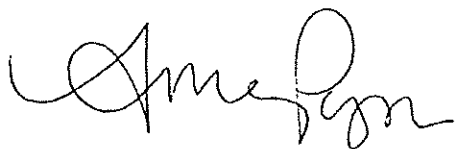
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Network

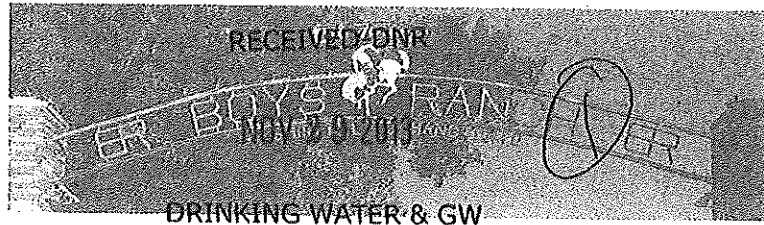
Promote

- **Continuing to pull water from the deep aquifer for Waukesha is environmentally irresponsible.** Waukesha's primary water source, the deep aquifer, is already down 400 to 600 feet and as the aquifer continues to decline, the water becomes brackish, like salt water. Contaminants such as radium, a known carcinogen, also increase with declining water levels. Continued pumping until the resource is exhausted is environmentally irresponsible and not sustainable for the long term.
- **Waukesha is not requesting Lake Michigan water to fuel development.** In Waukesha's service area approximately 70% of the land is developed; 15% is designated as environmentally protected; and only 15% is available for new development.
- **The City of Oak Creek, Wisconsin, a community with an established water utility and excess water pumping capacity, has agreed to sell water to Waukesha.** By selling water to Waukesha the ratepayers of Oak Creek can realize lower rates and increased inter-governmental cooperation. The Oak Creek/Waukesha agreement is an excellent example of how governments can work together to efficiently utilize taxpayer assets.
- **Waukesha needs a reliable water supply for the long term.** Waukesha examined many water supply alternatives. All the others have greater adverse environmental impacts and are less protective of public health. A Lake Michigan supply would sustainably provide a reliable water supply for the long term.

Sincerely,



Amanda Payne
Director, PR and Marketing
Waukesha County Business Alliance



262-895-2178 THOMAS A. JECHOREK
11-21-13 MASSIE LANG 28820 BEACH DRIVE
WATERFORD WI 53185

MY CONCERNS ON WAUKESHA'S
PLAN FOR LAKE MICHIGAN WATER.

IF WATER IS BEING RETURNED
TO LAKE MICHIGAN, HOW IS THE
FOX RIVER / LAKE MICHIGAN GOING
TO MAINTAIN IT'S WATER LEVEL?

NOW ABOUT THE WATER
LEVELS ALL THE WAY THRU THE
CHAIN OF LAKES IN ILLINOIS?

THE DEPTH IN THE
FOX RIVER IN THE WATERFORD
AREA IS BARRELY DEEP ENOUGH

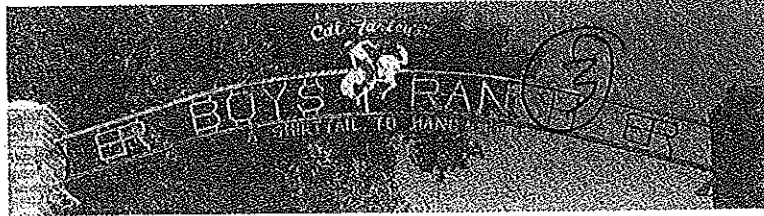


to float the Residents
Pontoon Boats!

Rain water MUST ADD
A tremendous Amount of
water Into the Fox River. But
now it's Going Into L. Michigan

I Doubt that the
water table in Waukesha County
will Be Able to maintain
enough water flow into
the Fox R.!" to keep up with
the current water Level.

I AM NOT AGAINST
WAUKESHA RECEIVING L. MICHIGAN
water. But I have not Read
OR heard About ANY ONE



Addressing this Potential Problem,

I've Heard Rumors About
Dredging the Fox But I Believe
this is A Pipe Dream Due to
the Cost!

If Illinois Says No
to this will this End this
Project?

From what I have seen
Around Franklin the Root
River is very NARROW AND
the potential of Floods would
create A very Deep + wide
CHANNEL. If this is
where the water will
eventually Be Discharged.



④
Thank you for

Receiving this letter of
CONCERNIS OF MINE.

I SAY GOOD LUCK
to WAUKESHA + hope that
+ his ONGOING ~~with~~ Problem
will Be Resolved.

RECEIVED-DNR

NOV 29 2013

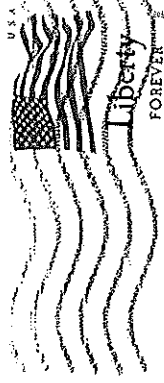
DRINKING WATER & GW

/s/ [Signature]

Thomas Jechorek
28820 Beach Dr
Waterford, WI 53185

2014年12月

1. 他定員の村の人口は、



WISCONSIN DNR DG/5

P.O. Box 7921

MA01504W1- 53707-7921

ATTN. PASSIE LANG